TELANGANA STATE POWER GENERATION CORPORATION LIMITED

5 X 800 MW YADADRI TPS

TECHNICAL SPECIFICATION FOR

220V DC BATTERY CHARGER

FOR TBG APPLICATIONS

SPECIFICATION NO: ***TB-387-316-007***

BHARAT HEAVY ELECTRICALS LIMITED

TRANSMISSIONS PROJECT
ENGINEERING MANAGEMENT

BHARAT HEAVY ELECTRICALS LIMITED
TRANSMISSION PROJECTS ENGINEERING MANAGEMENT

DOCUMENT No.	TB-387-316-007	Rev. No.	00		Prepared	Checked	Approved
TYPE OF DOC.	TECHNICAL SPECIFICATION			NAME	NK	SKS	AG
TITLE: 220 V, 240A & 48 V, 100A FLOAT & FLOAT-CUM-BOOST BATTERY CHARGER				SIGN			
				DATE	07.07.20	07.07.20	07.07.20
				GROUP	TBEM		

CUSTOMER	TELANGANA STATE POWER GENERATION CORPORATION LTD
PROJECTS	**400 kV Switchyard at 5X800MW Yadadri TPS**

CONTENTS

Rev No.	Date	Altered	Checked	Approved	REVISION DETAILS			
				Distribution	TBMM	TBQM	TBCM	TBTS
				Copies	2	-	-	-

SECTION - 1

1.1 SCOPE

This technical specification covers the requirements of design, manufacture, testing at works, packing and dispatch of 220V and 48V Float and Float-cum-Boost Battery Charger complete in all respects for efficient and trouble free operation along with supervision of testing and commissioning at site.

This section covers the scope, quantities & project specific technical requirements as specified by the customer for 220V & 48 V Battery Chargers. The Specific Technical Requirements for the above item are given in Section-2. The offered equipment shall also comply with the General Technical Requirements for the project as detailed under section-3 of this specification.

In case of any discrepancies between the requirements mentioned under Section-1, Section-2 and those specified in the Section-3, the specifications given in this section shall prevail and shall be treated as binding requirements.

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

The equipment is required for the following project's:

Name of the Customer : Telangana State Power Generation Corp. Ltd.
Name of the Project1 : 400 kV Switchyard at 5X800MW Yadadri TPS
Consultant : TCE Bangalore

The scope of supplies shall be as per commercial terms and conditions enclosed separately with the enquiry.

1.2 SPECIFIC TECHNICAL REQUIREMENTS

Equipment and system shall be designed to meet the following major technical parameters as brought out hereunder. For detailed technical requirements, please refer Section-2, Annexure-1.

1	Nominal Voltage Rating (V)	220 V	48 V
2	Rated Current Capacity	240 A	100 A
3	Voltage regulation in		
a	- float charging	±1%	±1%
b	- boost charging	±1%	±1%
4	Short Circuit Level		
a	A.C. (for 1 Sec.)	50 kA	50 kA
b	D.C. (for 1 Sec.)	25 kA	25 kA
	Battery Data		
1	Rating	1605 (AH)	645 (AH)
2	Type of Battery	Lead-Acid (Plante) type	
3	Proposed method of working (Volts per Cell)		

a	Float Charging (normal)	2.25 V/Cell	
b	Equalising charge (occasional)	2.33 V/Cell	
c	Boost Charging/cell (after complete discharge)	2.75 V/Cell (Max.)	
	Note: 220 V DC system is unearthed & 48 V DC system is +ve earthed		
	Battery Charger		
1	Charger	Float & Float-cum-Boost charger	
2	Type	Solid-state, full wave, fully controlled with microprocessor based AVR, three phase bridge, suitable for continuous duty application.	
3	Enclosure	Sheet steel enclosure, IP-42	
	System Condition		
1	3 phase A.C. supply	415 V - 50 Hz	415 V - 50 Hz
2	1 phase A.C. supply	240 V - 50 Hz	240 V - 50 Hz
3	Voltage Variation	-15% to +10 %	
4	Frequency Variation	+3 % to -5 %	
5	Combined volt + frequency variation	10% (absolute sum)	
6	Short-circuit level	50KA r.m.s. symmetrical	
	System earthing	Solidly earthed	
	Performance Requirements	a) The output voltage of the charger shall be regulated within ± 1% of the set value for any load variation from 0 to 100% and A.C. input voltage and frequency variations as indicated above in system condition b) The ripple content in charger DC output shall be limited to 1% (rms) with or without battery.	

DISCHARGE RESISTOR BANK

Type:	Portable
Construction:	Sheet steel enclosed,
Resistor material:	Copper-nickel alloy/stainless steel
Enclosure Protection Class:	IP-32
Cooling:	Forced air-cooled
Rating:	To meet the functional requirement C10 Rate
Control:	Using rotary switches for step control of current against falling voltage with ON OFF facility.

1. Boost/Float-cum-boost charger shall be sized to restore the fully discharged battery to full charge condition in ten (10) hour.
2. Size of cable between battery charger & distribution board's shall be intimated during detailed engineering stage. Bidder to provide TB's of appropriate size as per the input.

It will be battery charger supplier's responsibility to ensure proper co-ordination and satisfactory operation of the offered chargers with stationary batteries procured separately by BHEL.

1.3 BILL OF QUANTITIES

Sl. No.	Details	Unit	Qty (Nos)
1.3.1	**Main Items**		
1	**220V, 240A Float and Float cum Boost Charger** complete in all respects for efficient and trouble free operation as per technical specification	Sets	2
2	**48V, 100A Float and Float cum Boost Charger** complete in all respects for efficient and trouble free operation as per technical specification	Sets	2
3	Battery Discharge Resistor Unit (suitable for 220V & 48V Battery)	Set	1
4	Portable Single Cell Charger (for 220V Battery)	Set	1
5	Portable Single Cell Charger (for 48V Battery)	Set	1
1.3.2	**Mandatory Spares as per clause 1.3.5**		
1	Mandatory spares for 220V Battery charger	Lot	1
2	Mandatory spares for 48V Battery charger	Lot	1
1.3.3	**Services**		
1	Supervision of Installation, Testing & Commissioning of 220V, 240A Float and Float cum Boost Charger	Lot	2
2	Supervision of Installation, Testing & Commissioning of 48V, 100A Float and Float cum Boost Charger	Lot	2
1.3.4	**Special Tools & Tackles as per clause 1.3.6**		
1	Special tools & tackle	Lot	1

Notes: -

i) Each set of battery charger shall be equipped with accessories like base channel frame, floor channel sill and kick plates for all floor-mounted charger panels, complete with holding down bolts and nuts and terminals with lugs for connecting cables from battery, cables from DC board and control cables. Prices of above accessories or any other accessory required are deemed to be included in prices of Main items.

ii) Alarms and indications as per list of "ÄLARMS & AND INDICATIONS" specified in section-2 shall be provided with each charger. Prices of these alarms and indications or any other alarms and indications required are deemed to be included in prices of Main items.

1.3.5 List of Mandatory Spares

Bidder has to supply following items for Battery chargers as mandatory spares:

S. No.	Details	Unit	Qty (220V)	Qty (48V)
1.	Fuses & fuse links	Nos.	200% of total quantity for each type & rating of fuses used in the system.	200% of total quantity for each type & rating of fuses used in the system.
2.	SCR	Nos.	8 Nos. for each type and rating.	8 Nos. for each type and rating.

3.	Diode	Nos.	8 Nos. for each type and rating.	8 Nos. for each type and rating.
4.	Indicating lamps	Nos.	10	10
5.	Electronic Module/ PCB/Card	Nos.	2 (Two) Nos. each type used in the system.	2 (Two) Nos. each type used in the system.
6.	Pulse transformer	Set	4	4

If any mandatory spares specified in BOQ are not applicable as per battery charger design, bidder to supply equivalent spares for the same.

1.3.6 Special Tools & Tackles

A set of special tools & tackle which are necessary or convenient for erection, commissioning, maintenance and overhauling of the equipment shall be supplied.
The tools shall be shipped in separate containers, clearly marked with the name of the equipment for which they are intended.

1.3.7 Recommended Spares

The Bidder shall submit a list of recommended spare parts for five (5) years satisfactory and trouble free operation, indicating the itemized price of each item of the spares. The prices of these shall be indicated in separate schedules and these shall not be considered for the purpose of evaluation.

1.4 TYPE TESTING

Bidder shall submit valid type test reports (as per relevant IEC/IS standard) for the tests carried out after 17.10.2012. The reports should have been conducted on identical or similar equipment/ components to those offered. In case type test reports are earlier than 17.10.2012 or the reports of type tests are found to be technically unacceptable by TSGENCO, the type test shall be conducted by the vendor without cost and delivery implication to BHEL.

1.5 QUALITY PLAN

The bidder to follow BHEL/ TSGENCO approved quality plan at contract stage.
.

1.6 SUPERVISION OF INSTALLATION & COMMISSIONING

Manufacturer of Battery Charger shall supervise the installation and commissioning and perform commissioning tests as recommended in O&M manual / or relevant standards. All necessary instruments, material, tools and tackles required for installation, testing at site and commissioning are to be arranged by Battery Charger manufacturer.

1.7 TITLE BLOCK

The drawings / documents submitted shall be project and product specific and shall incorporate following details:

a) Project Name : 400 kV Switchyard at 5X800MW Yadadri TPS
b) Customer Name : Telangana State Power Generation Corp. Ltd.
c) Consultant Name : TCE, Bangalore
d) Contractor : BHEL
e) Customer LOA no. : ED/TPC/SE-III/YADADRI TPS(5X800MW)/D.No. 102/17, Dated: 17/10/2017

1.8 Drawings / Documents

The drawings / documents submitted shall be project and product specific and shall incorporate all project details and title block of the customer as detailed in Section 1, 2 & 3.

The drawings/ documents, as follows shall be used for providing engineering manufacturing clearance of the equipment (220 V & 48V Battery Chargers) and furthermore, it shall be used for delay analysis, if any from bidder.

The schedule for submission and resubmission shall be in line with details provided in section-3.

1	OGA, SLD, BOM, GTP & CKT Diagram/Scheme drawings
2	Type Test Reports
3	Quality Assurance Plan & Inspection Test Schedule

Date of Submission of first lot of drawings/ documents shall be counted only from the date of submission of reasonably correct drawings/ documents.

The successful bidder shall have to extend all possible supports like timely submission/ re-submission of drawings, visit to end customer to facilitate documents approval without any commercial implications to BHEL. Acceptance of bidder's documents shall be subject to end customer approval.

- - x x - -

SECTION – 2

2.1 GENERAL TECHNICAL REQUIREMENTS

APPLICABLE STANDARDS

IS:3895	-	Mono-crystalline Semiconductor Rectifier Cells and Stacks
IS:4540	-	Mono-crystalline Semiconductor Rectifier Assemblies and Equipment.
IS:6619	-	Safety Code for Semiconductor Rectifier Equipment
IS:2026	-	Power Transformers
IS:2959	-	AC Contactors for Voltages not Exceeding 1000 Volts
IS:1248	-	Indicating Instruments
IS:2208	-	HRC Fuses
IS:13947 (Part-3)	-	Air break switches, air break disconnectors & fuse combination units for voltage not exceeding 1000V AC or 1200V DC
IS:2147	-	Degree of protection provided by enclosures for low voltage switchgear and controlgear
IS:6005	-	Code of practice for phosphating of Iron and Steel
IS:3231	-	Electrical relays for power system protection
IS:3842	-	Electrical relay for AC Systems
IS:5	-	Colours for ready mix paint
IEEE-484	-	Recommended Design for installation design and installation of large lead storage batteries for generating stations and substations.

2.2 Codes and Standards

All equipment and materials shall be designed, manufactured and tested in accordance with the latest applicable Indian Standards (IS) and IEC except where modified and/or supplemented by this specification.

Equipment and material conforming to any other standard which ensures equal or better quality, may be accepted. In such case, copies of the English version of the standard adopted shall be submitted along with the bid.

The electrical installation shall meet the requirements of Indian Electricity Rules as amended upto date and relevant IS Code of Practice. In addition, other rules and regulations applicable to the work shall be followed.

2.3 Design Basis

The battery and charger combination shall be such as to ensure continuity of DC supply at load terminals at all times without even momentary interruption. For continuous operation at specified ratings, temperature rise of the various components of battery charger shall be limited to the permissible values stipulated in the relevant standards and/or this specification.

The equipment will be installed indoor in a clean but hot, humid and tropical atmosphere.
For the purpose of design an ambient temperature of 50oC and relative humidity of 85% shall be considered.

2.4 System Concept

The battery charger shall be capable of providing the initial charging current as required for the battery.

a) One (1) no. float and float cum boost battery chargers will be provided for each set of battery which is normally ON in float charging mode, supplying the DC load current and at the same time float charging the battery. Both the float chargers are in parallel mode of operation. Due to failure of one charger, the other charger will take full load requirement and the charactistics shall be such that if load is high and exceeds the charger capacity, the excess load shall be supplied by the battery.

b) When the float-cum-boost charger will be in boost charging mode (when battery voltage drops below a set value) and in boost charging mode it will boost charge a fully discharged battery to fully charged condition in 10 hours. The other float charger will supply DC load current.

c) Float-cum-boost charger shall also have provision for float, equalizing and boost charging the battery through manual selection.

d) On failure of A.C. supply both chargers will go out of service and battery will take over to supply emergency loads without any interruption.

e) Suitable electrical interlock shall be provided in the charger to ensure that boost charging can commence only after the relevant load isolating switch in the DCDB 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 charger, the other charger shall feed both sections of the DCDB and provided trickle charging to both sets of battery.

f) Output of the chargers shall be controlled automatically as well as manually. AUTO/ MANUAL selector switch along with voltage/current setter shall be provided for this purpose.

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

2.5 Battery Charger 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.

2.6 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 for load bearing members and 1.6 mm for non-load bearing members.
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.

2.7 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

2.8 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 eight 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 Section-1.
g) The alarm shall be compatible with central DCS/SCADA

2.9 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. Charger panel shall be provided with the following meters:
a) Input voltmeter (0 – 500 V AC) with voltmeter selector switch.
b) Output DC voltmeter at each charger output.
c) Output DC voltmeter at battery output.
d) Output DC ammeter at each charger output (0 – 150% of rated full load charger output)
e) Battery charging / discharging ammeter.

2.10 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.

2.11 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.

2.12 Lamp/Space heaters/receptacles

a) The charger panels shall be provided with :-
Internal illumination lamp with door switch, the lamp shall be located in the ceiling and guarded with protective cage.
Space heater with thermostat control
5 pin 6A receptacle with plug
Communication plug.
b) Lamp, heater and receptacle circuits shall have individual ON-OFF switch fuse units and shall be suitable for 240V AC supply.

2.13 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 mm2 for control and current circuits and 1.5 mm2 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.

2.14 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.

2.15 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.

2.16 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.

2.17 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.

2.18 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

2.19 Battery Discharge Resistor Unit / Portable Single Cell Charger

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.
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.
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 item of the spares.

2.20 TESTS

All equipment and components thereof shall be subject to shop tests as per relevant IS standards.

Following minimum tests shall be performed on each battery charger.
a) Dielectric tests.
b) Voltage regulation check from 0 to 100% load with ±10% input voltage variation.
c) Ripple content measurement.
d) Heat run test on current limiting value.
e) Functional test.

All other routine tests shall be carried out on each equipment as per relevant standard.

2.21 SUBMISSION OF DOCUMENTS

Following drawings and document shall be submitted.
(a) General Technical Particular (GTP)
(b) GA & Foundation Plan Drgs.
(c) Schematics
(d) Write-up on operation
(e) Charger Characteristics in Boost and Float mode
(f) Complete technical literature supported by catalogues
(g) Quality plan
(h) Field Quality plan
(i) Type Test Reports
(j) Storage and Installation Instruction
(k) Operation and Maintenance Manual

All drawings shall be prepared by using Auto CAD, approved version and documents shall be generated using MS Office. The paper copy of the drawings & document shall be submitted for approval & reference. All final drawings and documents shall be submitted in CD in Auto CAD (approved version) and MS office format as applicable for Purchaser's future reference.

2.22 LIST OF ALARMS & AND INDICATIONS

1.0 Following list of alarm / annunciation shall be provided at each charger.
a) AC supply failure.
b) Charger overload.
c) SCR fuse blown.
d) Filter fuse blown.
e) DC output fuse blown.
f) DC system under voltage.
g) DC system over voltage.
h) Battery earth fault.
i) AC Input fuse blown

2.0 Initiating contacts wired to two terminals at battery charger panel shall be provided for group annunciation "Battery Charger Trouble" of the events mentioned above, at central control room. Separate contacts shall be provided for "Battery earth fault" annunciation at central back-up panel.

3.0 I Initiating contacts for all alarm points shall also have electrically separate spare set of contacts wired to the terminal block for future use.

4.0 All alarm contacts shall be rated 5.0A at 220V DC and 10 Amp. at 240V AC.

5.0 In addition to the alarm points mentioned above, any other alarm point, if required for battery charger, shall be provided.

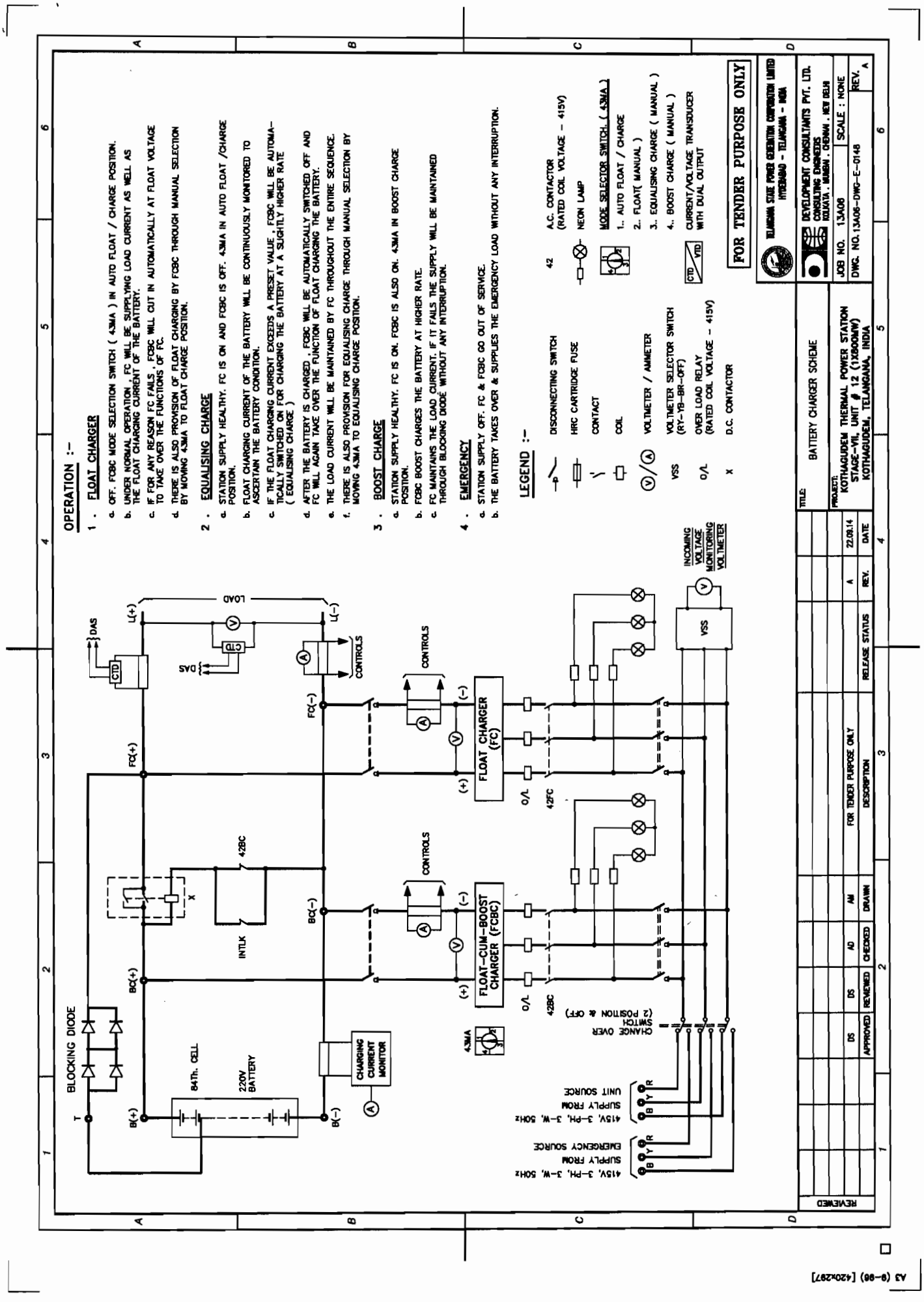
6.0 Charger panel shall also have the following minimum indications:

a) Charger power supply ON (at all three phases)
b) Charger DC output healthy.
c) Control supply ON.
d) DC supply healthy.
e) Float / boost charger in operation (in float-cum-boost charger)

2.23 SCHEDULE OF PRE-COMMISSIONING TESTS OF BATTERY CHARGER

The following tests (but not limited to the same) are a general guideline. Other tests as necessary shall also be conducted.

a) Insulation resistance test.
b) Test on transformer (I.R., voltage ratio).
c) Automatic voltage regulator & annunciator operation & testing.
d) Load test.
e) Functional check of battery charger.
f) Calibration test of relays and meters of battery charger.
g) Space heater operation check.
h) Annunciations.



A3 (9-96) [420x297]

SECTION - 3

PROJECT DETAILS AND GENERAL SPECIFICATIONS

GENERAL TECHNICAL REQUIREMENTS

1.0 PROJECT DETAILS

Customer	:	M/s Telangana State Power Generation Corporation Ltd.
Project Title	:	5x800MW Yadadri Thermal Power Station
Project Location	:	Veerlapalem Village, Damercherla Mandal, Nalgonda District, Telangana
Nearest Railway station	:	Vishnupuram railway station.
Nearest Road Head	:	NH-9 is at 45km North SH-2 is at 7km South
Nearest Airport	:	Hyderabad (about 120 Km)
Postal Address	:	Chief Engineer (O&M), 5X800MW Yadadri Thermal Power Station, TSGENCO, Village - Veerlapalem, Mandal- Dameracheral, Dist. – Nalgonda, Telangana

1.1 SITE CONDITIONS (FOR DESIGN PURPOSES)

1.1.1 SITE CONDITIONS

a).	Average rainfall per year	:	1124 mm
b).	Maximum hourly rainfall intensity	:	102 mm
c).	Altitude	:	1000 m

1.1.2 DESIGN AMBIENT

a).	Minimum Temperature	:	13.5°C
b).	Maximum Temperature	:	45°C
c).	Design Ambient Temperature	:	50 °C

1.1.3 RELATIVE HUMIDITY

a).	Maximum	::	85%

1.1.4 WIND PRESSURE (AS PER IS:875-1987)

a). Design wind speed : 44 m/sec.

1.1.5 SEISMIC FACTORS

a). Horizontal Seismic Coefficient : As per latest IS : 1893

b). Vertical Seismic Coefficient : As per latest IS : 1893

} ***Zone – III***

1.1.6 ELECTRICAL DATA

		400 kV System	415V AC System	240V AC System	220 V DC System	48 V DC System
1.	Nominal Voltage	400 kV	415 V	240 V	220 V	48 V
2.	Highest System Voltage	420 kV	457 V	264 V	242 V	55 V
3.	No. of phases	3	3	1	NA	NA
4.	Frequency	50 Hz	50 Hz	50 Hz	NA	NA
5.	Voltage variation	± 5%	± 10 %	± 10 %	+10 % to -15%	± 10 %
6.	Neutral Earthing	Effectively Earthed	Solidly Earthed	Solidly Earthed	-	-
7.	Fault Level	50 kA for 1 sec.	50 kA for 1 sec.	50 kA for 1 sec.	15 kA for 1 sec.	-

1.1.7 SYSTEM PARAMETERS

Dry and wet one minute power frequency withstand voltage	630 kVrms
Dry impulse withstand voltage positive and negative	1425 kVpeak
Minimum Total Creepage	25 mm/kV

1.1.8 MINIMUM CLEARENCE (AS PER IS: 10118)

Phase to phase (PP)	4200 mm
Phase to earth (PE)	3500 mm
Section clearance	6500 mm
Minimum ground clearance from plinth level (Plinth level : 300 mm)	8000 mm

Vertical ground clearance to nearest part not at earth potential of an insulator supporting live conductor/ equipment	2440 mm

1.2 INSTRUCTION TO BIDDERS

The bidders shall submit the technical requirements, data and information as per the technical data sheets, provided in Section-4.

The bidders shall furnish catalogues, engineering data, technical information, design documents, drawings etc fully in conformity with the technical specification. It is recognised that the Manufacturer may have standardised on the use of certain components, materials, processes or procedures different than those specified herein. Alternate proposals offering similar equipment based on the manufacturer's standard practice will also be considered provided such proposals meet the specified designs, standard and performance requirements and are acceptable to the Purchaser. Unless brought out clearly, the Bidder shall be deemed to conform to this specification scrupulously.

1.3 STANDARDS

The works covered by the specification shall be designed, engineered, manufactured, built, tested and commissioned in accordance with the Acts, Rules, Laws and Regulations of India.

The equipment to be furnished under this specification shall conform to latest issue (with all amendments) of specified standards.

In addition to meeting the specific requirement called for in Sections 1 and 2 of the Technical Specification, the equipment shall also conform to the general requirement of the applicable standards, which shall form an integral part of the specification. The Bidder shall note that standards mentioned in the specification are not mutually exclusive or complete in themselves, but intended to complement each other. When the specific requirements stipulated in the specifications exceed or differ from those required by the applicable standards, the stipulation of the specification shall take precedence.

Other internationally accepted standards, which ensure equivalent or better performance than that specified in the standards referred, shall also be accepted. The bidder shall submit copies of such standards.

In case governing standard for the equipment is different from IS or IEC, the salient points of difference shall be clearly brought out in the offer along with English language version of standard or relevant extract of the same. The equipment conforming to standards other than IS/IEC shall be subject to Purchaser's / owner's approval. The bidder shall clearly indicate in his bid the specific standards in accordance with which the works will be carried out.

1.4 TYPE TESTING, INSPECTION, TESTING & INSPECTION CERTIFICATE

All equipment being supplied shall conform to type tests and shall be subject to routine and acceptance tests in accordance with requirements stipulated under respective sections. Purchaser reserves the right to witness any or all the tests. The Manufacturer shall intimate the Purchaser the detailed programme about the tests at least three (3) weeks in advance in case of domestic supplies & six (6) weeks in advance in case of foreign supplies. Purchaser reserves the option for getting any or all the type tests repeated on the equipment. The Manufacturer shall also submit type test procedure for approval of the Purchaser.

In the event of any discrepancy in the test reports i.e. any test report not acceptable due to any design/manufacturing changes (including substitution of components) or due to non-compliance with the requirement stipulated in the technical specification or any/all additional type tests not carried out without any additional cost implication to the Purchaser.

The price of conducting all tests and additional type tests is deemed to be included in Bid price. In case any bidder indicates that he shall not carry out a particular test, his offer shall be considered incomplete and shall be liable to be rejected.

The purchaser intends to repeat the type tests and additional type tests on cables for which test charges shall be payable as per provision of contract.

The Purchaser, his duly authorised representative and/or outside inspection agency acting on behalf of the Purchaser shall have at all reasonable times free access to the Contractors premises or Works and shall have the power, at all reasonable times to inspect and examine the materials and workmanship of the Works during its manufacture or erection if pert of the Works is being manufactured or assembled at other premises or works, the Manufacturer shall obtain for the Engineer and for his duly authorized representative permission to inspect as if the works were manufactured or assembled on the Manufacturer's own premises or works. Inspection may be made at any stage of manufacture, dispatch or at site at the option of the Purchaser and the equipment if found unsatisfactory due to bad workmanship or quality, material is liable to be rejected.

The Manufacturer shall give the Purchaser/inspector thirty (30) days written notice of any material being ready for testing. Such tests shall be to the Manufacturer's account except for the expenses of the inspector. Unless witnessing of the tests is virtually waived, the Purchaser/ inspector will attend such tests within thirty (30) days of the date of which the equipment is notified as being ready for test/ inspection, failing which the Manufacturer may proceed with the test which shall be deemed to have been made in the Inspector's presence and the Manufacturer shall forthwith forward duly certified copies of test reports in triplicate to the Inspector.

The Purchaser or Inspector shall, within fifteen (15) days from the date of inspection as defined herein, give notice in writing to the Manufacturer, of any objection to any drawings and all or any equipment and workmanship which in his opinion is not in accordance with the Contract. The

Manufacturer shall give due consideration to such objections and shall either make the modifications that may be necessary to meet the said objections or shall confirm in writing to the Purchaser/ inspector giving reasons therein, that no modifications are necessary to comply with the Contract.

When the factory tests have been completed at the Manufacturer's works, the Purchaser/ inspector shall issue a certificate to this effect within fifteen (15) days after completion of tests but if the tests are not witnessed by the Purchaser/inspector, the certificate shall be issued within fifteen (15) days of receipt of the Manufacturer's Test certificate by the Engineer/ Inspector. Failure of the Purchaser/inspector to issue such a certificate shall not prevent the Manufacturer from proceeding with the Works. The completion of this test or the issue of the certificate shall not bind the Purchaser to accept the equipment should it, on further tests/ after erection, be found not to comply with the Contract. The equipment shall be dispatched to site only after approval of test reports and issuance of MICC by the Purchaser.

In all cases where the Contract provides for tests whether at the premises or at the works of the Manufacturer or of any Sub-Contractor, the Manufacturer except where otherwise specified shall provide free of charge such items as labour, materials, electricity, fuel, water, stores, apparatus and instruments as may be reasonably demanded by the Purchaser /Inspector or his authorised representative to carry out effectively such tests of the equipment in accordance with the Contract and shall give facilities to the Purchaser Inspector or to his authorised representative to accomplish testing.

The inspection by Purchaser and issue of Inspection Certificate thereon shall in no way limit the liabilities and responsibilities of the Manufacturer in respect of the agreed quality assurance programme forming a part of the Contract.

The Purchaser will have the right of having at his own expenses any other test(s) of reasonable nature carded out at Manufacturer's premises or at site or in any other place in addition of aforesaid type and routine tests, to satisfy that the material comply with the specification.

The Purchaser reserves the right for getting any field tests not specified in respective sections of the technical specification conducted on the completely assembled equipment at site. The testing equipment for these tests shall be provided by the Purchaser.

1.5 MATERIAL/WORKMANSHIP

1.5.1 GENERAL REQUIREMENT

Where the specification does not contain characteristics with reference to workmanship, equipment, materials and components of the covered Equipment it is understood that the same must be new, of highest grade of the best quality of their kind conforming to best engineering practice and suitable for the purposes for which they are intended.

The design of the Works shall be such that installation, future expansions, replacements and general maintenance may be undertaken with a minimum of time and expenses. Each component shall be designed to be consistent with its duty and suitable factors of safety, subject to mutual agreements and shall be used throughout the design. All joints and fastenings shall be devised, constructed and documented so that the component parts shall be accurately positioned and restrained to fulfil their required function. In general screw threads shall be standard metric threads. The use of other thread forms will only be permitted when prior approval has been obtained from purchaser.

Whenever possible, all similar part of the Works shall be made to gauge and shall also be made interchangeable with similar parts. All spare parts shall be interchangeable with, and shall be made of the same materials and workmanship as the corresponding parts of the Equipment supplied under the Specification. Where feasible, common component units shall be employed in different pieces of equipment in order to minimize spare parts stocking requirements. All equipment of the same type and rating shall be physically and electrically interchangeable.

All materials and equipment shall be installed in strict accordance with the manufacturer's recommendation(s). Only first-class work in accordance with the best modern practices will be accepted. Installation shall be construed as being the erection of equipment at its permanent location. This, unless otherwise specified, shall include unpacking, cleaning and lifting into position, grouting, levelling, aligning, coupling of or bolting down to previously installed equipment bases/foundations, performing the alignment check and final adjustment prior to initial operation, testing and commissioning in accordance with the manufacturer's tolerances /instructions and the Specification. All factory assembled rotating machinery shall be checked for alignment and adjustments made as necessary to re-establish the manufacture’s limits. Suitable guards shall be provided for the protection of personal on all exposed rotating and / or moving machine parts and shall be designed for easy installation and removal for maintenance purpose. The spare equipment(s) shall be installed at designated locations and tested for healthiness.
The Contractor shall apply oil and grease of the proper specification to suit the machinery, as is necessary for the installation of the equipment. Lubricants used for installation purposes shall be drained out and the system flushed through where necessary for applying the lubricant required for operation. The Contractor shall apply all operational lubricants to the equipment installed by him.
All oil, grease and other consumables used in the Works/ Equipment shall be purchased in India unless the Contractor has any special requirement for the specific application of a type of oil or grease not available in India. If such is the case, he shall declare in the proposal where such oil or grease is available. He shall help purchaser in establishing equivalent Indian make and Indian Contractor. The same shall be applicable to other consumables too.

1.5.2 **PROVISIONS FOR EXPOSURE TO HOT AND HUMID CLIMATE**

Outdoor equipment supplied under the specification shall be suitable for service and storage under tropical conditions of high temperature, high humidity, heavy rainfall and environment favourable to

the growth of fungi and mildew. The indoor equipments located in non-air conditioned areas shall also be of same type.

1.6 COLOUR SCHEME AND CODES FOR PIPE SERVICE

The contractor shall propose a colour scheme for those equipment/Items for which the colour scheme has not been specified in the specification for the approval of purchaser. The decision of purchaser shall be final. The scheme shall include:

Finishing colour of Indoor equipment

Finishing colour of Outdoor equipment.

Finish colour of all cubicles.

Finishing colour of various auxiliary system equipment including piping

Finishing colour of various building items.

All steel structures, plates etc. shall be painted with non-corrosive paint on a suitable primer. It may be noted that normally all electrical equipment in switchyard are painted with shade 631 of IS-5. All The indoor cubicles shall be of same colour scheme and for other miscellaneous items, colour scheme will be approved by the purchaser.

1.7 PAINTING

a) All sheet steel work shall be phosphated in accordance with the following procedure and in accordance with IS: 6005 "Code of practice for Phosphating Iron and Steel".

b) Oil, grease, dirt and swerve shall be thoroughly removed from emulsion by cleaning.

c) Rust and scale shall be removed by pickling with dilute acid followed by washing with running water, rinsing with slightly alkaline hot water and drying.

d) After phosphating, thorough rinsing shall be carried out with clean water followed by final rinsing with dilute bichromate solution and over drying.

e) The phosphate coating shall be sealed by the application of two coats of ready mixed, stoving type zinc chromate primer. The first coat may be "Flash dried" while the second coat shall be stoved.

f) After application of the primer, two coats of finishing epoxy paint shall be applied, each coat followed by stoving. The panel shall have colour conforming to shade 631 of IS-5 for outside and inside of the panel with black colour for base frame.

g) Each coat of primer and finishing paint shall be of a slightly different shade to enable inspection of the painting.

h) Finished painted appearance of panel shall present an asthetically pleasing appearance free from dents and uneven surface.

i) A small quantity of finishing paint shall be supplied for minor touching up required at site after the installation of the panels.

1.8 PROTECTION

a) All coated surfaces shall be protected against abrasion, impact, discoloration and any other damages. All exposed threaded portions shall be suitably protected with either a metallic or a non-metallic protecting device. All ends of all valves, pipings and conduit equipment connections shall be properly sealed with suitable devices to protect them from damage.

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

c) The parts which are likely to get rusted, due to exposure to weather should also be properly treated and protected in a suitable manner.

d) Screens of corrosion resistant material shall be furnished on all ventilating louvers to prevent entry of insects.

1.9 FUNGISTATIC VARNISH

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

1.10 SURFACE FINISH

All interiors and exteriors of tanks, control cubicles and other metal parts shall be throughly cleaned to remove all rust, scales, corrosion, greases or other adhering foreign matter. All steel surfaces in contact with insulating oil as far as accessible shall be painted with not less than two coats of heat resistant, oil insoluble, insulating paints.

All metal surfaces exposed to atmosphere shall be given two primer coats of zinc chromate and two coats of epoxy paint with epoxy base thinner. All metal parts not accessible for paintaing shall be made of corrosion resisting material. All machine finished or bright surfaces shall be coated with a suitable preventive compound and suitably wrapped or other wise protected. All paints shall be carefully selected to withstand tropical heat and extremes of weather within the limit specified. The paint shall not scale off or wrinkle or be removed by abrasion due to normal handling.

1.11 GALVANIZING

All ferrous parts including all sizes of nuts, bolts, Plain and spring washers, support channels, structures, shall be hot dip galvanised conforming to latest version of IS:2629 or any other equivalent authoritative standard. However, hardware less than M12 size shall be electro-galvasized. Minimum weight of zinc coating shall be 610 gm/sq.mm and minimum thickness of coating shall be 85 microns for all items thicker than 6mm. For items lower than 6 mm thickness, requirement of coating shall be as per relevant ASTM.

1.12 AUXILIARY POWER SUPPLY

1.12.1 A.C power supply for auxiliaries will be available at 240 V, 50 C/s 1-phase, 2 wire and 415V, 50 C/s, 3-phase, 4 wire, neutral solidly earthed with variation in frequency of +/-5% and variation in voltage +/-10%

1.12.2 D.C. power supply at 220 V, 2-wire ungrounded will be available 187 V to 242 V.

1.13 INSPECTION AND TESTING

All tests and inspection of the equipment specified shall be performed to the extent and in the manner as stipulated in the relevant standards and in this specification. All type tests/routine tests/acceptance tests as specified shall be conducted in the presence of purchaser. Wherever equipment similar to the one being offered has already been type tested within 5 years from the date of opening the bid. Type tests done in an independent government laboratory or in the presence of representative of State Electricity Board or other reputed public undertakings, the type test reports of the same shall be submitted for scrutiny /approval. If these are found suitable and technically acceptable, conducting of type tests shall be waived off. Otherwise the subcontractor will have to carry out the type tests without any extra cost and without any delivery implications.

1.14 PACKAGING

Aluminium Tube shall be partially packed with Hessians cloths. Similar items shall be grouped and tied with steel wires/strip for convenient handling during transits.

MARKINGS

The following details are to be clearly indicated in the material forwarding documents:

a) Name and address of the consignee.

b) Purchase order number.

c) Name of supplier/s.

d) Description of equipment / material.

e) Tare weight.

f) Gross weight.

All the equipments shall be suitably protected, coated, covered or boxed and crated to prevent damage or deterioration during transit, handling and storage at Site till the time of erection. On request of the purchaser, the Contractor shall also submit packing details/associated drawing for any equipment material under his scope of supply, to facilitate the purchaser to repack any equipment/ material at a later date, in case the need arises, while packing all the materials, the limitation from the point of view of availability of Railway wagon sizes in India should be taken account of. The Contractor shall be responsible for any loss or damage during transportation, handling and storage due to improper packing. Any demurrage wagons and other such charges claimed by the transporters, railways etc. shall be to the account of the Contractor. Purchaser takes no responsibility of the availability of the wagons.

1.15 HANDLING, STORING AND INSTALLATION

In accordance with the specific installation instructions as shown on manufacturer's drawings or as directed by the purchaser or his representative, the Contractor shall unload, store, erect, install, wire, test and place into commercial use all the equipment included in the contract. Equipment shall be installed in a neat, workmanlike manner so that it is level, plumb, square and properly aligned and oriented. Commercial use of switchyard equipment means completion of all site tests specified and energisation at rated voltage.

Contractor may engage manufacturer's Engineers to supervise the unloading, transportation to site, storing, testing and commissioning of the various equipment being procured by them separately. Contractor shall unload, transport, store, erect, test and commission the equipment as per instructions of the manufacturer's supervisory Engineer(s) and shall extend full cooperation to them.

In case of any doubt/misunderstanding as to the correct interpretation of manufacturer's drawings or instructions, necessary clarifications shall be obtained from the purchaser.

Contractor shall be held responsible for any damage to the equipment consequent to not following manufacturer's drawings/instructions correctly.

Where assemblies are supplied in more than one section, contractor shall make all necessary mechanical and electrical connections between sections including the connection between buses. Contractor shall also do necessary adjustments/alignments necessary for proper operation of circuit breakers, isolators and their operating mechanisms. All components shall be protected against damage during unloading, transportation, storage, installation, testing and commissioning. Any equipment damaged due to negligence or carelessness or otherwise shall be replaced by the contractor at his own expenses.

Contractor shall be responsible for examining all the shipment immediately of any damage, shortage, discrepancy etc. for the purpose of Purchaser's information only. The Contractor shall submit to the

purchaser every week a report detailing all the receipts during the weeks. However, the Contractor shall be solely responsible for any shortages or damages in transit, handling and/or in storage and erection of the equipment at Site. Any demurrage, pilferage and other such charges claimed by the transporters, railways etc. shall be to the Contractor' account.

The Contractor shall be fully responsible, for the equipment/material until the same is handed over to the purchaser in an operating condition after commissioning. Contractor shall be responsible for the maintenance to the equipment/material while in storage as well as after erection until taken over by Purchaser, as well as protection of the same against theft, element of such nature, corrosion, damages etc.

The Contractor shall be responsible for making suitable indoor storage facilities, to store all equipments which require indoor storage.

The words erection and installation used in the specification are synonymous. Exposed live parts shall be placed high enough above ground to meet the requirements of electrical and other statutory safety codes.

The minimum phase to earth, phase to phase and section clearance along-with other technical parameters for the various switchyard voltage levels to be maintained shall be strictly as per the approved drawings.

The design and workmanship shall be in accordance with the best engineering practices to ensure satisfactory performance throughout the service life. If at any stage during the execution of the Contract, it is observed that the erected equipment(s) do not meet the above minimum clearances, the Contractor shall immediately proceed to correct the discrepancy at his risks and costs.

1.16 TOOLS AND TACKLES

The Contractor shall supply with the equipment one complete set of all special tools and tackles for the erection, assembly, dis-assembly and maintenance of the equipment. However, these tools and tackles shall be separately, packed and brought on to Site.

1.14 EQUIPMENT BASES

A cast iron or welded steel base-plate shall be provided for all rotating equipment, which is to be installed on a concrete base unless otherwise agreed to by the Purchaser. Each base-plate shall support the unit and its drive assembly, shall be of a neat design with pads for anchoring the units shall have a raised lip all around, and shall have threaded drain connections.

1.15 QUALITY

BHEL quality plan to be followed subject to TBEM / customer's approval.

1.16 DOCUMENTATION

1.16.1 DRAWINGS

All drawings shall be prepared in AutoCAD and ultimate documentation would include drawings/documents on CDs. All dimensions and data shall be in SI metric units.

All items of the equipment should be clearly identified by proper part nos. in the contract drawings. Such parts, which are to be dispatched to site from works in dispatchable units and are reassembled at site, should be marked by proper identification marks at works and indicated in the drawings and quantified. The shipping list should be sent along with the general arrangement drawings for engineer's approval. All the items of the shipping list should be identified in the drawing.

The drawing submitted by the supplier shall be reviewed by the purchaser as far as practicable within two weeks of receipt of drawings and shall be modified by the sub-contractor if any modifications and/or corrections are required by the purchaser. The sub-contractor shall incorporate such modifications and / or corrections and submit the final drawings for approval. Any delay arising out of failure of the subcontractor to rectify the drawings shall not alter the contract completion date.

Further work by the subcontractor shall be in strict accordance with these drawings and no deviation shall be allowed without the written approval of the purchaser.

All manufacturing and fabrication work in connection with the equipment prior to the approval of the drawings shall be at supplier's risk.

Approval of drawing or work by the purchaser/consultant shall not relieve the subcontractor of any of his responsibilities and liabilities under the contract.

In case of any modifications that may be necessary during erection or commissioning of the equipment, the subcontractor shall carry out modifications in the original drawing & submit 'As Built drawings' and required no. of prints thereof.

1.16.2 INSTRUCTION MANUALS

The supplier shall submit to the purchaser, draft instruction manuals for approval within 30 days of placement of order. The final instruction manuals complete in all respects shall be submitted 60 days before the first shipment of the equipment. The instruction manuals shall contain full details and drawings of all the equipment furnished, the erection procedures, testing, operation & maintenance procedures of the equipment.

If after the commissioning and initial operation of the plant, the instruction manuals require any modification/ addition / changes, the same shall be incorporated and the up- dated final instruction manuals shall be submitted as required.

1.16.3 **TITLE BLOCK & DRAWING/ DOCUMENT NUMBERING SCHEME**

Title block for drawing / document should be followed as per ANNEXURE-3

1.16.4 **DOCUMENTATION SCHEDULE AT CONTRACT STAGE**

A.	For approval	No of Copies
	Copies of all drawings with project details, dimension, shipping weights, No. of cases & dimensions, fixing details, tolerance etc.	10
	Copies of type test reports.	5
	Copies of works quality plan & field quality plan.	5
	Copies of installation, operation & maintenance manual.	5
	Copies of drawings on floppies/CDs	1 set
B.	After approval and for information / distribution	
	Copies of all drawings	15
	Copies of installation, operation & maintenance manual including Routine test reports	15
	Sets of RTF of drawings	2
	CDs of Drgs and O & M Manuals	4
C.	As Built Drawings	
	Hard copies of Drawings	15
	CDs	4

NOTE:

1. Any revision of drawings / documents shall be submitted in the same no. of copies submitted first time for approval
2. Final drawings / documents shall be submitted in bound volume with customer and project details etc. written on the top.

B. **BATTERY CHARGER**

Float/Float-cum-Boost Charger

1.0 **GENERAL**

1.1	(Ψ) Make	:
1.2	(Ψ) Cat. No	:
1.3	Type	:
1.4	Reference Standard	:

2.0 **RATING**

2.1 A.C. Input

a)	Voltage ± % variation Volt		:
b)	Phase No.		:
c)	Frequency ± % variation	Hz	:
d)	(Ψ) Input amps at rated load including supply of battery charging current		:

2.2	(Ψ) D.C. Output			
	a)	Voltage	Volt/Cell	:
	b)	Current	Amp.	:
2.3	Type of Cooling			:
2.4	Maximum Temperature within cubicle above 50`C ambient			
	a)	Rectifier transformer	Deg. C	:
	b)	SCR	Deg. C	:

3.0 **PERFORMANCE**

3.1	Regulation for 0-100% rated load with ± 10% input voltage and ± 5% input frequency variation %			:
3.2	Ripple content in D.C. output			
	a)	With battery	%	:
	b)	Without battery	%	:
3.3	(Ψ) efficiency at rated load		%	:
3.4	(Ψ) Power Factor at rated laod		%	:

4.0 **MISCELLANEOUS**

4.1	Charger provided with following features		
	a)	Automatic voltage regulation	:
	b)	Current limiting circuitry	:
	c)	Smoothing filter circuit	:
	d)	Soft-start feature	:
	e)	Is manual operation permissible ?	:
4.2	SCR elements provided with		
	a)	Surge protection	:
	b)	Fast acting HRC fuse	:

5.0	**A.C. SWITCH**			
5.1	(Ψ) Make		:	
5.2	Type/Cat. No.		:	
5.3	Reference Standard		:	
5.4	(Ψ) Rated Current	Amp	:	
6.0	**A.C. FUSE**			
6.1	(Ψ) Make			:
6.2	Type/Cat. No.		:	
6.3	Reference Standard		:	
6.4	(Ψ) Current rating			
	a) Continuous	Amp	:	
	b) Interrupting	KA	:	
7.0	**A.C. CONTACTOR**			
7.1	(Ψ) Make			:
7.2	Type/Cat. No.		:	
7.3	Reference Standard		:	
7.4	(Ψ) Rated Current	Amp	:	
7.5	Utilization category		:	
7.6	Thermal overload with in-built single-phase preventor provided ?		:	
8.0	**RECTIFIER TRANSFORMER**			
8.1	(Ψ) Make			:
8.2	Type/Cat. No.		:	
8.3	Reference Standard		:	

8.4	(Ψ) Ratings			
	a) (Ψ) KVA			:
	b) (Ψ) Voltage ratio		:	
	c) (Ψ) Vector group		:	
	d) (Ψ) %impedance at 75 Deg.C		:	
8.5	Class of insulation		:	
8.6	Method of cooling		:	
9.0	**CONTROLLED RECTIFIER (SCR)**			
9.1	(Ψ) Make			:
9.2	Type/Cat. No.		:	
9.3	Reference Standard		:	
9.4	(Ψ) Rms Current rating	Amp	:	
9.5	(Ψ) Surge Current			
	a) One-cycle	Amp	:	
	b) Repetitive cycle	Amp	:	
9.6	(Ψ) Peak inverse voltage			
	a) Continuous	Volt	:	
	b) Surge	Volt	:	
10.0	**FILTER CHOKE**			
10.1	(Ψ) Make		:	
10.2	(Ψ) Value	mH	:	
10.3	(Ψ) Quantity		:	
10.4	Class of Insulation		:	
11.0	**FILTER CAPACITOR**			
11.1	(Ψ) Make and Type		:	

11.2	Voltage Class	Volt	:	
11.3	(Ψ) Current Rating	Amps	:	
11.4	(Ψ) Quantity		:	
12.0	**D.C. FUSE**			
12.1	(Ψ) Make			:
12.2	Type/Cat. No.		:	
12.3	Reference Standard		:	
12.4	(Ψ) Current rating			
	a) Continuous	Amp	:	
	b) Interrupting	KA	:	
13.0	**D.C. CONTACTOR**			
13.1	(Ψ) Make		:	
13.2	Type/Cat. No.		:	
13.3	Reference Standard		:	
13.4	(Ψ) Current rating	Amp	:	
13.5	Utilization category		:	
13.6	Economy resistor provided		:	Yes/No
14.0	**BLOCKING DIODES**			
14.1	(Ψ) Make			:
14.2	Type/Cat. No.		:	
14.3	Reference Standard		:	
14.4	(Ψ) Current rating			
	a) One-minute	Amp	:	
	b) One-hour	Amp	:	
14.5	(Ψ) Peak inverse voltage	Volt	:	

15.0	**INDICATION LIGHTS**			
15.1	(Ψ) Make			:
15.2	Type/Cat. No.		:	
15.3	Reference Standard		:	
15.4	(Ψ) Wattage	Watt	:	
15.5	(Ψ) Series resistor	Ohm	:	
16.0	**METERS**			
16.1	(Ψ) Make			:
16.2	Type/Cat. No.		:	
16.3	Reference Standard		:	
16.4	Size		:	
16.5	Accuracy		:	
17.0	(Ψ) **ALARM-FACIA**			
17.1	Make		:	
17.2	Type/Cat. No.		:	
17.3	Reference Standard		:	
17.4	No. of window per facia		:	
18.0	**CHANGE-OVER SWITCH**			
18.1	(Ψ) Make		:	
18.2	Type/Cat. No.		:	
18.3	Reference Standard		:	
18.4	(Ψ) Rating	Amp	:	
18.5	No. of poles		:	
18.6	Key interlock furnished ?		:	

19.0	**D.C. SWITCH**			
19.1	(Ψ) Make			:
19.2	Type/Cat. No.		:	
19.3	Reference Standard		:	
19.4	(Ψ) Rating	Amp	:	
19.5	No. of poles		:	
19.6	Key interlock furnished ?		:	
20.0	**CHARGER PANEL**			
20.1	(Ψ) Make			:
20.2	Type		:	
20.3	Reference Standard		:	
20.4	Enclosure			
	a) Degree of protection		:	
	b) Sheet steel thickness	mm	:	
20.5	Panel provided with			
	a) Internal lamp with door-switch		:	
	b) Space heater with thermostat		:	
	c) 5A 3-pin receptacle		:	
20.6	Internal Wiring			
	a) Insulation		:	
	b) Voltage grade		:	
	c) Minimum conductor size		:	
20.7	Power Terminals			
	a) (Ψ) Make		:	
	b) (Ψ) Size/Cat. No.		:	
20.8	Control Terminals			

	a) (Ψ) Make		:
	b) (Ψ) Size/Cat. No.		:
	c) 20% spare terminal furnished ?		:
20.9	Ground Terminal furnished ?		:
20.10	(Ψ) Overall dimension (LxBxH)	mm	:
20.11	(Ψ) Approx. Weight	Kg	:
20.12	(Ψ) General Arrangement drawings furnished ?		:
20.13	Accessories as specified furnished with battery charger ?		:

C. **DISCHARGE RESISTOR BANK**

1.00	Type	:	
2.00	Construction	:	
3.00	Resistor material	:	
4.00	Enclosure Protection Class	:	
5.00	Cooling	:	
6.00	(Ψ) Rating	:	
7.00	Control	:	
8.00	(Ψ) Painting	:	
	Interior		
	Exterior		Shade No……..of IS-5
9.00	Reference standard	:	

SECTION 5
CHECK LIST FOR INFORMATION TO BE FURNISHED WITH OFFER RETURN THIS CHECKLIST AS PART OF THE OFFER DULY SIGNED

PLEASE NOTE:

a) The offer may not be considered if the following information and this Checklist are not enclosed with the Offer.

b) The evaluation of bidder against qualifying criteria specified under Technical PQR of technical specification shall be based on the documentary proof submitted by bidder along with the offer. Hence bidder shall ensure the completeness of their offer in this regard.

BHEL ENQUIRY. NO:

S.No.	Qualifying criteria (Annexure-B)	Documentary proof required	Yes/No
1	The manufacturer, whose Chargers are offered, should have manufactured and supplied at least two (2) numbers of static automatic voltage regulator type Battery Chargers of highest offered rating or above, at least one (1) each at two (2) different industrial installations, which should be in successful operation for at least two (2) years on 17.10.2017.	Documentary proof attached	

S. No.	Parameters	Data	Yes/No	Remarks
1	Type of Battery Charger	a) Static Type with automatic regulators. b) Compatible with Lead Acid (Plante) Batteries	Yes/No	
2	Float charging	Offered battery chargers are capable of continuous operation at respective rated load at 2.25 Volts per cell while supplying the DC Load	Yes/No	
3	Equalising Charging	Offered battery chargers are capable of equalising charging at 2.33 Volts per cell while supplying the DC Load	Yes/No	
4	Boost Charging	Offered Battery chargers are capable of boost charging associated DC battery at 2.75 Volts per cell at the desired rate	Yes/No	
5	Voltage and Current control	a) All offered battery chargers shall be provided with facility for both automatic and manual control of the output voltage and current. b) Charger output voltage variation shall be within +/- 1%	Yes/No	
6	Ripple content in output voltage	Suitable filter circuits shall be provided in all chargers to limit the ripple content in charger DC output to 1% (rms) with or without battery	Yes/No	
7	Rectifier Transformer	Dry air cooled (A.N), Class F insulation type	Yes/No	
8	Remote Indication	I.)Provision of Potential free NO contacts	Yes/No	

		for following abnormalities – a) AC supply failure. b) Charger overload. c) SCR fuse blown. d) Filter fuse blown. e) DC output fuse blown. f) DC system under voltage. g) DC system over voltage. h) Battery earth fault. i) AC Input fuse blown j) Any other annunciation (as recommended by manufacturer) Separate contacts shall be provided for "Battery earth fault" indication. II) Potential free contact for Float / boost modes provided		
9	Charger construction	In line with clause 2.6 (Section-2)	Yes/No	
10	Tests	Shall be performed in line with clause In line with clause 2.20 (Section-2)	Yes/No	
11	Type test reports	Bidder shall submit valid type test reports (as per relevant IEC/IS standard) for the tests carried out after 17.10.2012. The reports should have been conducted on identical or similar equipment/components to those offered. In case type test reports older than 17.10.2012 or the reports of type tests are found to be technically unacceptable by BHEL/Customer, the type test shall be conducted by the vendor without cost and delivery implication to BHEL.	Yes/No	
12	Mandatory spares quoted in line with clause 1.3.5 of section-1		Yes/No	
13	Special tools & tackles as per clause 1.3.6 of section-1 included in the scope of supplies		Yes/No	
14	Transducers as per clause 2.10 (Section-2) included in the scope of supplies		Yes/No	
15	Bidder to confirm that it will offer approved make of components & fitments at Contract stage. In case the offered make is not approved by the Customer, then alternate make shall be supplied without any commercial implication to BHEL.		Yes/No	

ANNEXURE - A
SCHEDULE OF TECHNICAL DEVIATIONS

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

S.No.	Page No.	Clause No.	Deviation	Reason / Justification

Any deviation not specifically brought out in this section shall not be admissible for any commercial implication at later stage. Except to the technical deviations listed in this schedule, bidder's offer shall be considered in full compliance to the tender specifications irrespective of any such deviation indicated / taken elsewhere in the submitted offer.

Date: Tenderer's Stamp & Signature

TELANGANA STATE POWER
GENERATION CORPORATION LIMITED

5 X 800 MW YADADRI TPS

VOLUME – II

TECHNICAL SPECIFICATION FOR

220V & 48V DC BATTERY CHARGER

SPECIFICATION NO: ***PE-TS-417-508-E002***

BHARAT HEAVY ELECTRICALS LIMITED

CONTENTS

TELANGANA STATE POWER GENERATION CORPORATION LIMITED

5 X 800 MW YADADRI TPS

VOLUME – II

TECHNICAL SPECIFICATION FOR

220V DC BATTERY CHARGER

FOR PEM APPLICATIONS

SPECIFICATION NO: ***PE-TS-417-508-E002-A***

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

	DOCUMENT TITLE	SPECIFICATION NO. PE-TS- 417-508-E002-A	
	TECHNICAL SPECIFICATION FOR 220V DC BATTERY CHARGER	VOLUME II	
		SECTION I	
		REVISION 0	DATE: 17.03.2021
		SHEET 1 of 1	

CONTENTS

	DOCUMENT TITLE **TECHNICAL SPECIFICATION FOR220V DC BATTERY CHARGER**	SPECIFICATION NO. PE-TS- 417-508-E002-A	
		VOLUME II	
		SECTION I	
		REVISION 0	DATE 17.03.2021
		SHEET 1 of 1	

COMPLIANCE CERTIFICATE

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

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

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

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

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

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

BIDDER'S STAMP & SIGNATURE

	DOCUMENT TITLE **TECHNICAL SPECIFICATION FOR 220V DC BATTERY CHARGER**	SPECIFICATION NO. PE-TS- 417-508-E002-A
		VOLUME II
		SECTION I
		REVISION 0 / DATE: 17.03.2021

SECTION –I

SPECIFIC TECHNICAL REQUIREMENTS

	DOCUMENT TITLE	SPECIFICATION NO. PE-TS- 417-508-E002-A	
	TECHNICAL SPECIFICATION FOR 220V DC BATTERY CHARGER	VOLUME II	
		SECTION I	
		REVISION 0	DATE: 17.03.2021
		SHEET 1 of 2	

1.0 SCOPE OF ENQUIRY

1.1 Design, Manufacture, Inspection and Testing at Manufacturer's works, proper packing, delivery to site and Supervision of E&C of **220V DC BATTERY CHARGER** conforming to this specification.

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

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

1.4 The documents shall be in English Language and MKS system of units.

2.0 BILL OF QUANTITIES:

2.1 Quantity requirements shall be as per 'BOQ-cum-price schedule' as part of NIT.

3.0 SPECIFIC TECHNICAL REQUIREMENTS

3.1 Technical /Quality/ Inspection:

S. No.	*Reference clause No. of Section II (if any)*	*Specific Requirement/ Change*
1	5.1 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.	Float charger shall be natural cooled . FCBC shall be force cooled . Please refer to clause 3.0 of data sheet -A
2	11.3 The details of Type Tests to be conducted shall be as per Section-I of specification	Details of type test shall as per section - II and QAP

4.0 TEST

All tests as per the specification, QP and relevant standards shall be carried out. Charges for these shall be deemed to be included in the quoted price.

	DOCUMENT TITLE	SPECIFICATION NO. PE-TS- 417-508-E002-A	
	TECHNICAL SPECIFICATION FOR 220V DC BATTERY CHARGER	VOLUME II	
		SECTION I	
		REVISION 0	DATE: 17.03.2021
		SHEET 2 of 2	

5.0 DRAWINGS REQUIRED ALONG WITH TECHNICAL OFFER

i. Unpriced Price Schedule as enclosed with NIT with "Quoted" word against items with bidder's signature and company stamp.
ii. A copy of the sheet "Compliance certificate" with bidder's signature and company stamp.
iii. "Deviation Schedule" with "NO DEVIATION" and bidder's signature and company stamp.

6.0 DRAWINGS & DOCUMENTS TO BE SUBMITTED AFTER PLACEMENT OF ORDER

Schedule of drawing & documents to be submitted is part of **NIT**

3.03.00 Battery Charger

3.03.01 General

a) All chargers shall be 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 step less, 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.

3.03.02 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) The panel shall conform to the degree of protection IP 42. Minimum thickness of sheet metal used shall be 2 mm for load bearing members and 1.6 mm for non-load bearing members.

c) 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.

d) 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.

e) 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.

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

g) 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.

3.03.03 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 temperaturerise 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 forwardcurrent, minimum momentary overloads & voltage spikes. The current& peak inverse voltage (PIV) should be chosen accordingly. Wherevernecessary 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 thatfailure 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 with2 NO + 2 NC auxiliary contacts. The switch shall be installed in such amanner 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, rated10A at operating voltage.

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

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

g) Push button shall be heavy duty, shrouded, push to actuate type withcolored 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 besupplied 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 downstream 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) Ground fault relay shall be provided to detect DC system groundleakage current.

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

3.03.03 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) 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.

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

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

3.03.04 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.

3.03.05 Controls

The following (but not limited to) manual controls shall be provided on thefront 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.

3.03.06 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 1.5 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 devicesshall be wired up to the terminal block.

f) Gland plate shall be of 4 mm thick, non-magnetic material and suitablefor 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.

3.03.07 Terminal Block

a) 1100V grade, multi way terminal block complete with mounting channel,binding screws and washers for wire connections and marking strip forcircuit 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 beso 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.

3.03.08 Grounding

a) The charger panels shall have fully rated ground bus with two groundterminals, 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 entireassembly. 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 runindependently to the ground bus and connected thereto.

3.03.09 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.

3.03.10 Painting

a) The sheet metal of the panels shall be thoroughly cleaned by chemicalagents (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 dueto normal handling.

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

3.03.11 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 40mmx 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 respectivedevices 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

PACKING SPECIFICATION FOR BATTERY CHARGER

CHARGER shall be despatched in "Crate Packing" using wood.

1.0 PREPARATION OF PACKING CASES:

1.1 **DIMENSIONS:**

1.1.1 Minimum number of planks shall be used for a shook.

1.1.2 Thickness of planks for Front, rear, top and bottom sides and binding, jointing battens shall be 25/20mm +2/-3 mm

1.1.3 Horizontal, vertical, diagonal planks shall be given for binding

1.1.4 Width of binding planks shall be minimum 100mm

1.1.5 Distance between any 2 binding planks shall be less than 750mm

1.1.6 Diagonal planks shall be used in between vertical binding planks when distance between inner to inner of vertical planks is more than 750mm

1.1.7 Distance of the outer edges of these planks from the edge of case shall be less than 250mm.

1.1.8 Diagonal planks are not required for top planks and width side, if the width of pallet is less than 750mm.

1.2 JOINTING OF PLANKS:

Single length planks shall be used for cubicles whose overall length is less than 2400 mm. For cubicles of length more than 2400 mm, jointing is permitted. The jointing shall be done with one single or maximum of 2 planks of wood same as other planks of width 250 mm (minimum) with two rows of nails on either side of the joint in zigzag manner. From the joint along height side, it shall be of lap joint with overlap of at least the width of plank.

1.3 PERMISSIBLE DEFECTS

Wood shall be free from knots, bows, visible sign of infection and any kind of decay caused by insects, fungus, etc.

End splits: Longest end splits at each end shall be measured and lengths added together. The added length shall not exceed 60mm per meter run of shook's. Wood pins shall be used to prevent further development of split.

Surface cracks: Surface cracks with a maximum depth of 3mm are permissible. A continuous crack of any depth all along the length is not allowed.

1.4 OTHER MATERIALS

1.5.1 NAILS

Nils of suitable dia and length shall be used for joining the planks.

1.5.2 BLUE NAILS

If applicable, these shall be used for nailing bituminized Kraft paper/hessian cloth to the planks.

1.5.3 HOOP IRON STRIPS

These are used for strapping the boxes. The material shall be free from rust. If sufficient nailing is done for bigger boxes, strapping need not be done.

1.5.4 CLIPS

These shall be used for strapping the hoop iron strips on the boxes.

1.5.5 BRACKETS

Brackets of suitable dimension shall be used for nailing to the corners of cubicle boxes. The brackets shall be of mild steel of suitable thickness. The brackets shall be of "L" shape. Two holes shall be provided towards the end of each side for screwing /nailing.

1.5.6 MULTI LAYERED CROSS LAMINATED POLYTHELENE FILM

100GSM(colourless) Multi Layered Cross Laminated Polyethylene Film shall be used to make covers to the jobs individually. The cross lamination gives qualities of extra toughness, together with flexibility and lightness coupled with good weather resistance to ultra violet rays.

1.5.6 RUBBERISED COIR:

The rubberized coir is used as cushioning material. For the packing of loose items, items are to be arrested by using rubberized coir.

1.5.7 FASTENERS

Bolts, double nuts, spring washers will have to be used to hold the job to the bottom plank of the box so that there shall be no jerk on the CHARGER during transit.

1.5.8 PACKING SLIP:

Packing slip kept in the polyethylene bag shall be placed in the box at appropriate place. In addition, one more packing slip covered in polyethylene cover and packing slip holder shall be nailed to front / rear of case.

1.5.9 MARKING PLATE:

Marking on the packing case shall be done as per the manufacturer standard.

	TECHNICAL SPECIFICATION FOR 220V DC BATTERY CHARGER	SPECIFICATION NO. PE-TS-417-508-E002-A
		VOLUME II B
		SECTION C
	5 X 800 MW YADADRI TPS	REVISION 0 DATE 17.03.2021
		SHEET 1 OF 3

DATASHEET-A

Sr. No.	PARAMETER	UNIT	VALUE
1.0	**Power Supply & fault level details**		
1.1	Rated AC voltage & variation	V, %	415 V, -15% to +10%, 3Ph- 3 Wire # Systems.
1.2	Frequency & variation	Hz, %	50Hz, +3% to -5%
1.3	Rated DC voltage & variation	V, %	220 V, 187 V to 242V
1.4	Fault current of 415V system	kA	50 kA for 1 sec.
1.5	Fault current of DC system limited upto (max)	KA	25 KA for 1 sec.
1.6	Type/ Capacity of battery (min)		Main plant Battery 5145 AH Lead-Acid Plante battery (THREE PARALLEL STRINGS OF 1715AH BATTERY i.e. 3 X 1715 AH) for Main Plant DC system indicated at Annexure-II (ONE LINE DIAGRAM FOR 220V DC SYSTEM FOR MAIN PLANT)
2.0	**Charger current rating**		
2.1	Float charger	A	i) 675A – Main Plant
2.3	Float-cum-boost charger	A	i) 975A – Main Plant
	Portable single cell boost charger	A	i) 325A
3.0	**Type of cooling**		i) Float Charger: Natural cooled ii) Float-cum-boost charger- Natural/Forced cooled (in case of forced cooling, minimum 2 x 100% fans shall be provided) iii) Portable single cell charger- Natural cooled
4.0	**Ripple content of charger**		
4.1	RMS	%	
4.2	Peak to peak	%	± 1%

5.0	**Degree of Protection (DOP)**		
5.1	Rectifier transformer cubicle		IP-42
5.2	Control cubicle		IP-42
6.0	**Constructional features**		
6.1	Panel sheet thickness/ material	mm	Min. 1.6mm Cold rolled sheet steel for panel fabrication with folded type construction and min. 2.0mm Cold rolled sheet steel for panel frame.
6.2	Paint shade		Light grey shade (631 of IS-5) with two coats of Synthetic enamel paint.
6.3	Cable gland plate thickness/ material	mm	3 mm / Sheet steel
6.4	Gasket thickness/ material	mm	3 mm / Rubber
6.5	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		Actual cable size and number of runs shall be informed during detailed engineering.
7.0	**Type Tests**		
7.1	Type tests to be conducted for this contract, despite availability of valid & acceptable testcertificates	Yes/ No	YES, As per Section – C/Quality plan. Heat Run test to be conducted on all chargers including single cell boost charger
8.0	**Earthing**		
8.1	Grounding terminal size/ no. for eachcharger		50X6 MM./ 2 nos
8.2	Grounding terminal size/ no. for each fusebox		50X6 MM./ 2 nos
8.3	Grounding terminal size/ no. for each discharge resistor		50X6 MM./ 2 nos
9.0	**Mandatory Spares**		
9.1	Mandatory Spares to be quoted for thiscontract	Yes/ No	Yes
9.2	If yes, list of mandatory spares		As per BOQ cum unpriced schedule enclosed with NIT
10.0	**E & C Spares**		
10.1	E & C Spares to be quoted for this contract	Yes/ No	Yes

10.2	If yes, list of E & C Spares		Asper BOQ cum unpriced schedule enclosed with NIT
11.0	**Special tools & tackles**		
11.1	Special tools & tackles to be quoted for thiscontract	Yes/ No	Yes (if applicable)
11.2	If yes, list of Special tools & tackles		Bidder to furnish lists.
12.0	**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. Minimum rating of Battery Fuse Box shall be as indicated in the BOQ cum price schedule.	
11	**Discharge Resistor Panel**	a) Portable type battery discharge resistor panels shall be supplied with shunt suitable for 10 hrs with Degree of Protection IP20. Discharge rate (C10 rate) as per battery capacities indicated in the BOQ cum price schedule (Sheet 1 of 2). b) Cooling of discharge resistor shall be air/fan cooled. c) Construction shall be same as Charger panel. Handle and wheel arrangement shall be provided for easy movement. d) Control - Using rotary switches for step control of current against falling voltage with ON-OFF facility..	

Notes :

i) BHEL will provide 3 PH-3 wire power Supply. Further distribution for single Phase shall becreated by Bidder.

ii) Min cable size and Nos. indicated. Nos. may increase during detailed engineering.

iii) Actual rating of Battery fuse box and discharge resistor panel shall be selected by thebidder based on load duty cycle (Annexure-II).

	TECHNICAL SPECIFICATION FOR 220V DC BATTERY CHARGER DATASHEET-C	SPECIFICATION NO. PE-TS-417-508-E002-A VOLUME II SECTION I REVISION 0 DATE: 17.03.2021 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 DATASHEET-C	SPECIFICATION NO. PE-TS-417-508-E002-A VOLUME II SECTION I REVISION 0 DATE: 17.03.2021 SHEET 1 of 3

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 DATASHEET-C	SPECIFICATION NO. PE-TS-417-508-E002-A VOLUME II SECTION I REVISION 0 DATE: 04.01.2021 SHEET 1 of 3

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.)		

	TECHNICAL SPECIFICATION FOR 220V DC BATTERY CHARGER	SPECIFICATION NO. PE-TS-417-[illegible]8-E002-A
		VOLUME II
		SECTION II
		REVISION 0 DATE: 17.03.2021
		SHEET 1 of 17

SECTION-II

STANDARD TECHNICAL REQUIREMENTS

1.0 INTENT OF SPECIFICATION

The intent of specification is not to specify all details of design & construction of material. The material shall, however, conform in all aspects to high standard of design, engineering and workmanship and be capable of performing in continuous operation up to & after bidder's guarantee period in manner acceptable to purchaser who will interpret the drawings & specification and shall have power to reject any work or material which in his judgement is not in full accordance with this specification.
This specification covers the design, manufacture, assembly, testing, packing and despatch of Battery charger (Float/Boost) complete in all respects with allcomponents, fittings and accessories for efficient and trouble-free operation. Thecharger shall be connected with Lead acid/Ni-Cd 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 & STANDARDS

2.1 The material shall comply with all currently applicable safety codes and statutory regulations of India as well as of the locality where the material is to be installed.

2.2 The design, material, construction, manufacture, inspection, testing and performance of 220V DC Battery Charger shall conform to the latest revision of relevant standards and codes of practices as per Annexure-I.

2.3 In case of conflict between the applicable reference standard and this specification, this specification shall govern.

3.0 SERVICES AND EQUIPMENT TO BE EXCLUDED

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

4.0 OPERATIONAL REQUIREMENTS

4.1 Under normal conditions, when the AC supply is healthy at the battery charger inputterminals, the float charger shall feed the continuous DC loads, while the boost charger shallremain 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.

4.2 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.

4.3 The DC system shall be ungrounded and shall float with respect to be ground potential when healthy.

4.4 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.

4.5 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.

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

5.0 BATTERY CHARGERS

5.1 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.

5.2 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.

5.3 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.

5.4 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 floatcharging mode i.e. trickle charging the associated DC batteries while supplying the DC loads.

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

5.6 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.

5.7 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.

5.8 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.

5.9 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, asthe 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.

5.10 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.

5.11 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.

5.12 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.

5.13 Momentary output voltage of the Charger, without the Battery connected shall be within 94% to 106% of the voltage setting during sudden load Change from 100% to 20% of full

load or vice-versa. Output voltage shall return to, and remain, within the limits (+/- 1% of the set value) in less than 2 seconds after the above mentioned change.

6.0 DESCRIPTION OF EQUIPMENT

6.1 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 / thyristorsand heat sinks to carry 200% of the load current continuously and the temperature of theheat 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 bewhen 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. Heat run test for other charger components shall be carried out at 100% ofrated current.

6.2 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.

6.3 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.

6.4 Voltage regulators

6.4.1 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.

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

6.5 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 tropicalized and masked.

6.6 Control and Selector Switches

The control and selector switches shall be of rotary stay put 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.

6.7 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.

6.8 Instruments

For all chargers, DC ammeter, DC voltmeter and AC voltmeter shall be provided in 96 mm2 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. Digital indicating instruments with built in communication port for remote data transfer shall be provided for all chargers, with display accuracy 0.5%, 4 digit-7 segment LED/LCD display and RS 485 Serial Bus port.

6.9 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.

6.10 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 andcharger output current. External power operated type transducer is also acceptable. 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

6.11 Contactors

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

6.12 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.

6.13 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.

6.14 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.

6.15 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 on the batteries shall be supplied.

6.16 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.

6.17 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 1.6 mm & 2.0 mm cold rolled sheet steel respectively, 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 lugsfor 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 tropicalized 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 electrolytic tinned copper cable lugs and double compression brass nickel-plated cable glands shall be provided in each panel for incoming and outgoing cables.

6.18 Electronic equipment 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. Non modular design is also acceptable.

6.19 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.

6.20 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.

6.21 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.

6.22 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 mm2. The control wiring terminating at electronic card shall not be less than 1.0 mm2. The control terminal shall be suitable for connecting two wires with 2.5 mm2 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 up to the terminal lugs. Whenever this clearance is not available, the live parts shall be insulated or shrouded.

	DOCUMENT TITLE	SPECIFICATION NO. PE-TS-417-508-E002-A
	TECHNICAL SPECIFICATION FOR220V DC BATTERY CHARGER	VOLUME II
		SECTION II
		REVISION 0 / DATE 17.03.2021
		SHEET 9 OF 17

6.23 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 CTsecondary 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.

6.24 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 electrolytic tinned copper cable lugs for power cables forms part of the supply of equipment. Cable lugs shall comply with IS-8309.

6.25 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.

6.26 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.

7.0 ANNUNCIATION SYSTEM

7.1 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) Charger 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).

7.2 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.

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

a)	Overall height	: Maximum 2350 mm
b)	Operating handles (Highest and lowest positions reached by operator's hands), Protective mechanical indicators	: Maximum 1800 mm Minimum 350 mm
c)	Doors & panel handles and locks	: Maximum 1800 mm Minimum 300 mm

8.0 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 equipment.

9.0 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.

10.0 PERFORMANCE GUARANTEE

The bidder shall guarantee that chargers offered shall meet the ratings and performance requirements stipulated for various equipment 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.

11.0 INSPECTION & TESTING

11.1 The bidder shall confirm compliance to Quality plan enclosed with Section-II 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.

11.2 All equipment 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 ten years from the date of techno commercial bid opening i.e. 17.10.2017 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. (Charges for carrying out all routine tests & type tests are deemed to be included in the price bid).

11.3 The details of Type Tests to be conducted shall be as per Section-I of specification.

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

i) Temperature rise test at full load for 8 hours.

ii) Temperature rise test for rectifier assembly at current specified in Data Sheet-A Section-I for 8 hours.

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:

	DOCUMENT TITLE	SPECIFICATION NO. PE-TS-417-508-E002-A
	TECHNICAL SPECIFICATION FOR220V DC BATTERY CHARGER	VOLUME II
		SECTION II
		REVISION 0 DATE 17.03.2021
		SHEET 12 OF 17

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

11.5 Rectifier transformers shall be subjected to following routine test:

i) Temperature rise test
ii) Insulation Resistance test for 8 hours.
iii) High voltage test (power frequency) test

11.6 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 for 8 hours.
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.

11.7 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.

11.8 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.

11.9 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.

12.0 INSTRUCTION MANUAL

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 monthsbefore 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.

I) Possible faults, their causes and remedies.

J) Catalogues, literature and drawings.

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

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

13.0 SPARES

13.1 Bidder to furnish the E & C spares as per BOQ cum Price Schedule.

14.0 TOOLS AND TACKLE (IF APPLICABLE)

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.

15.0 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.

16.0 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.

	DOCUMENT TITLE	SPECIFICATION NO. PE-TS-417-508-E002-A
	TECHNICAL SPECIFICATION FOR220V DC BATTERY CHARGER	VOLUME II
		SECTION II
		REVISION 0 DATE 17.03.2021
		SHEET 15 OF 17

ANNEXURE-I

LIST OF APPLICABLE STANDARDS

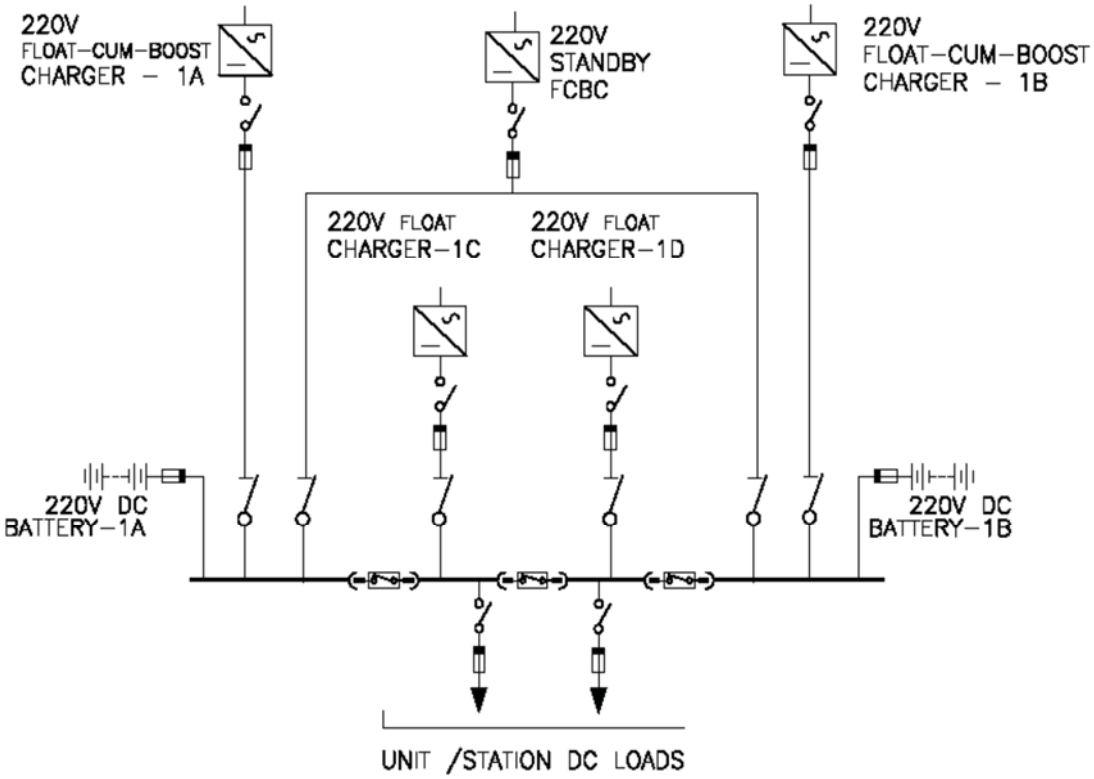
1.	GUIDE FOR SURGE WITHSTAND CAPABILITY TESTS	ANSI-C 37.90a
2.	COLOURS FOR READY MIX PAINTS	IS-5
3.	PVC INSULATED CABLE FOR WORKING VOLTAGE 1100V	IS-694
4.	INDICATING ANALOGUE ELECTRICAL MEASURING INSTRUMENTS	IS-1248
5.	DOP FOR LV SWITCHGEAR AND CONTROL GEAR PART-1	IS-13947
6.	SPECIFICATION FOR LV SWITCHGEAR 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 with other internationally accepted standards such as IEC, BS, VDE etc. will also be considered if they ensure performance and constructional features equivalent or superior to standards listed above. In such a case, the bidder shall clearly indicate the standards adopted, furnish a copy in English of the latest revision of the standards along with copy of all official amendments and revisions and shall clearly bring out the salient features for comparison.

ANNEXURE-II

ONE LINE DIAGRAM FOR 220 V DC SYSTEMS

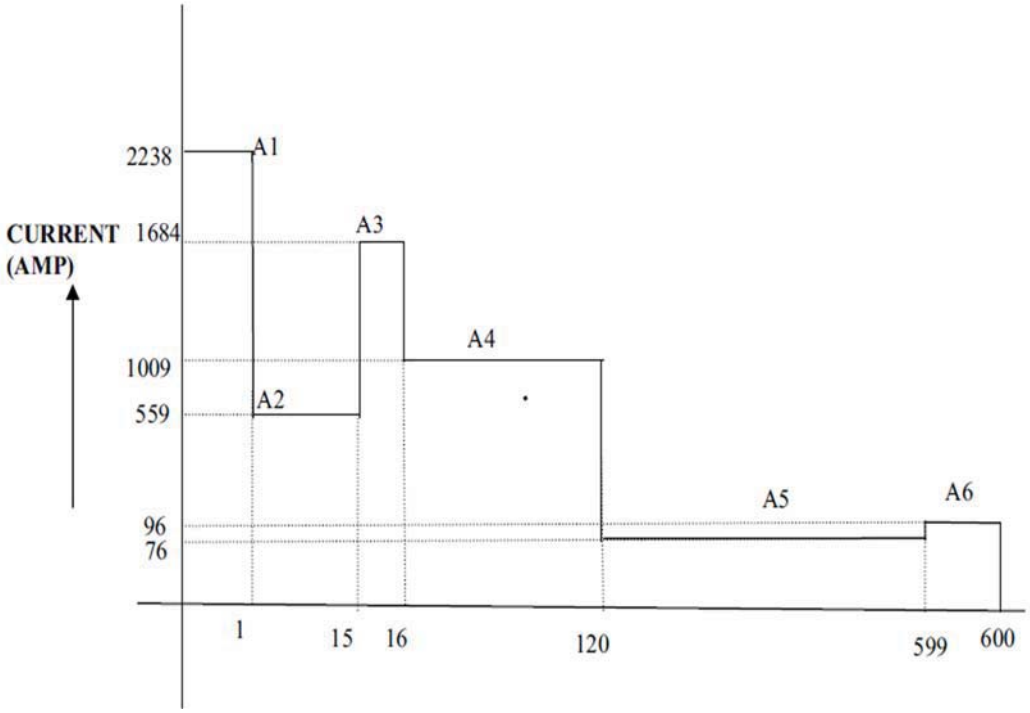
ONE LINE DIAGRAM FOR 220 V DC SYSTEM OF MAIN PLANT & ASSOCIATED STATION



ANNEXURE-III

LOAD DUTY CYCLE

LOAD DUTY CYCLE OF MAIN PLANT & ASSOCIATED STATION



FACTORS TO BE CONSIDERED FOR BATTERY SIZING:

. AGEING FACTOR	: 1.25
2. MIN.ELECTROLYTIC TEMP.	: 7 ◦C
3. END CELL VOLTAGE	: 1.80V PER CELL
4. DESIGN MARGIN	: 20%
5. TEMPERATURE CORRECTION FACTOR	: As per manufacturer's data
6. NO. OF CELLS	: 108

5 X 800 MW YADADRI TPS TECHNICAL SPECIFICATION FOR BATTERY CHARGER
SECTION-II ANNEXURE-IV SUBVENDOR LIST

ITEM/SERVICE DESCRIPTION	SL NO.	VENDOR CODE	VENDOR NAME	ADDRESS	PHONE	REMARKS
AC CONTACTORS	1	S01	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	2	A35	GE-POWER	KAMAK TOWER, 3RD FLOOR, PLOT NO. 12-A, TVK INDUSTRIAL ESTATE, EKKADUTHANGAL, GUINDY, CHENNAI-600032	044-49681447	
AC CONTACTORS	3	E1144	TELEMECHANIQUE/ SCHNEIDER ELECTRIC INDIA PVT. LTD.	9TH FLOOR, BLDG. NO. 10, TOWER-C, DLF CYBERCITY, PH-II, GURGAON-122002	0124-3940400	TAKEN OVER BYSCHNEIDER
AC CONTACTORS	4	L01	L&T	32, SHIVAJI MARG, P.O. BOX- 6223, NEW DELHI-110015	011-41419554/59	
AC CONTACTORS	5	B04	BCH	20/4, MATHURA ROAD, FARIDABAD, HARYANA-121006	0129-4293000	
AC LOAD BREAK SWITCH	1	A35	GE-POWER	KAMAK TOWER, 3RD FLOOR, PLOT NO. 12-A, TVK INDUSTRIAL ESTATE, EKKADUTHANGAL, GUINDY, CHENNAI-600032	044-49681447	
AC LOAD BREAK SWITCH	2	L01	L&T	32, SHIVAJI MARG, P.O. BOX- 6223, NEW DELHI-110015	011-41419554/59	
AC LOAD BREAK SWITCH	3	S01	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 LOAD BREAK SWITCH	4	E1076	KAYCEE	KAYCEE INDUSTRIES LTD., C/O-CMS COMPUTERS LTD., 35A, REAR BLDG., KILOKARI, NEW DELH1-110014	Rajiv Sharma-9312004687	
AC LOAD BREAK SWITCH	5	C01	C&S ELECTRIC LTD.	222, OKHLA IND. ESTATE, PH-III, NEW DELHI-110020	011-3088 7520-29	
AC MCCB	1	C01	C&S ELECTRIC LTD.	222, OKHLA IND. ESTATE, PH-III, NEW DELHI-110020	011-3088 7520-29	
AC MCCB	2	S03	SCHNEIDER ELECTRIC INDIAPVT. LTD.	9TH FLOOR, BLDG. NO. 10, TOWER-C, DLF CYBERCITY, PH-II, GURGAON-122002	0124-3940400	
AC MCCB	3	S01	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	4	A35	GE-POWER	KAMAK TOWER, 3RD FLOOR, PLOT NO. 12-A, TVK INDUSTRIAL ESTATE, EKKADUTHANGAL, GUINDY, CHENNAI-600032	044-49681447	
AC MCCB	5	L01	L&T	32, SHIVAJI MARG, P.O. BOX- 6223, NEW DELHI-110015	011-41419554/59	
AC MCCB	6	C02	CROMPTON GREAVES	RAIL TRANSPORTATION SYSTEMS,VANDANA BUILDING, 11, TOLSTOY MARG, TOLSTOY MARG, NEW DELHI, DL 110001	011 3041 6300	

ITEM/SERVICE DESCRIPTION	SL NO.	VENDOR CODE	VENDOR NAME	ADDRESS	PHONE	REMARKS
AIR CIRCUIT BREAKER	1	L01	L&T	32, SHIVAJI MARG, P.O. BOX- 6223, NEW DELHI-110015	011-41419554/59	
AIR CIRCUIT BREAKER	2	S01	SIEMENS	RC-IN I S NR DEL AREA, JIL BUILDING, TOWER-B, PLOT NO. 78, SECTOR 18, GURGAON-122015,	0124-2842000, 9873424331 amit.bhadauria@siemens.com	
AIR CIRCUIT BREAKER	3	A35	GE-POWER	KAMAK TOWER, 3RD FLOOR, PLOT NO. 12-A, TVK INDUSTRIAL ESTATE, EKKADUTHANGAL, GUINDY, CHENNAI-600032	044-49681447	
AIR CIRCUIT BREAKER	4	S03	SCHNEIDER ELECTRIC INDIA PVT. LTD.	9TH FLOOR, BLDG. NO. 10, TOWER-C, DLF CYBER CITY, PH-II, GURGAON-122002	0124-3940400	
AIR CIRCUIT BREAKER	5	C01	C&S ELECTRIC LTD.	222, OKHLA IND. ESTATE, PH-III, NEW DELHI-110020	011-3088 7520-29	
AUXILIARY RELAYS	1	A24	ABB	14, MATHURA ROAD, FARIDABAD, HARYANA-121003	0129-2567580, 09871799449	
AUXILIARY RELAYS	2	G01	ALSTOM LTD	A-7, SEC-65, NOIDA	0120-479 0000	
AUXILIARY RELAYS	3	E1075	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	4	E1099	OEN INDIA LTD	29/1479, VYTILLA, COCHIN - 682 019 KERALA, INDIA	Phone : +91 484 2301132, 2303709 Fax : +91 484 2302287, 2302221 sales@oenindia.com	
AUXILIARY RELAYS	5	S01	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	1	L01	L&T	32, SHIVAJI MARG, P.O. BOX- 6223, NEW DELHI-110015	011-41419554/59	
BIMETAL RELAYS	2	A35	GE-POWER	KAMAK TOWER, 3RD FLOOR, PLOT NO. 12-A, TVK INDUSTRIAL ESTATE, EKKADUTHANGAL, GUINDY, CHENNAI-600032	044-49681447	
BIMETAL RELAYS	3	S01	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	4	E1144	TELEMECHANIQUE/ SCHNEIDER ELECTRIC INDIA PVT. LTD.	9TH FLOOR, BLDG. NO. 10, TOWER-C, DLF CYBER CITY, PH-II, GURGAON-122002	0124-3940400	TAKEN OVER BYSCHNEIDER
CABLE GLANDS	1	E1201	ALLIED TRADERS & EXPORTERS	C-124 A, SECTOR-2, NOIDA -201 301, UTTAR PRADESH, INDIA	Mr. Vijay Mohan Sood +(91)-(120)-2525694 +(91)-(120)-3052594 +(91)-(11)-23287156 vijay_mohansood@yahoo.com	
CABLE GLANDS	2	E1017	ARUP ENGG & FOUNDARY WORKS	391/119,PRINCE ANWAR SHAH ROAD, CALCUTTA-700068	033 2473 0850	

5 X 800 MW YADADRI TPS TECHNICAL SPECIFICATION FOR BATTERY CHARGER
SECTION-II ANNEXURE-IV SUBVENDOR LIST

ITEM/SERVICE DESCRIPTION	SL NO.	VENDOR CODE	VENDOR NAME	ADDRESS	PHONE	REMARKS
CABLE GLANDS	3	E1206	BALIGA LIGHTING EQPT.PVT.LTD.	63A,CP RAMASWAMY ROAD, ALWARPET,P.B.No 6910, CHENNAI-600018	44-24995505,22680990-4	
CABLE GLANDS	4	E1036	COMMET BRASS PRODUCTS	NUTAN CHEMICAL COMPOUND, WALBHAT ROAD, GOREGAON, MUMBAI-400063	91-022-26852961/62/63 comet@vsnl.net	
CABLE GLANDS	5	DW08	DOWELLS	M/S. DOWELLS ELECTRICALS 47/47A, SATGURU INDUSTRIAL ESTATE. OFF AAREY ROAD, GOREGOAN (EAST). MUMBAI 400 063.	CEO : Mr. Jayantibhai S. Patel TEL: 022-32504770./022-29270876/ 022-29270878.	
CABLE GLANDS	6	E1044	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	7	I01	INCAB	HARE STREET,KOLKATA,WEST BENGAL-700001	91-33-2480161/62/63/64 Fax : 91-33-2485766	
CABLE LUGS	1	E1040	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	2	E1149	UNIVERSAL MACHINES LTD.	4,B.B.D.BAG (EAST) 90,STEPHEN HOUSE,5TH FLR CALCUTTA-700001	033 2282 2540	
D.C. MCCB	1	C02	CROMPTON GREAVES	RAIL TRANSPORTATION SYSTEMS,VANDANA BUILDING, 11, TOLSTOY MARG, TOLSTOY MARG, NEW DELHI, DL 110001	011 3041 6300	
D.C. MCCB	2	L01	L&T	32, SHIVAJI MARG, P.O. BOX- 6223, NEW DELHI-110015	011-41419554/59	
D.C. MCCB	3	A35	GE-POWER	KAMAK TOWER, 3RD FLOOR, PLOT NO. 12-A, TVK INDUSTRIAL ESTATE, EKKADUTHANGAL,	044-49681447	
D.C. MCCB	4	S01	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	
EARTH LEAKAGE CB	1	L01	L&T	32, SHIVAJI MARG, P.O. BOX- 6223, NEW DELHI-110015	011-41419554/59	
EARTH LEAKAGE CB	2	S01	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	
EARTH LEAKAGE CB	3	A35	GE-POWER	KAMAK TOWER, 3RD FLOOR, PLOT NO. 12-A, TVK INDUSTRIAL ESTATE, EKKADUTHANGAL, GUINDY, CHENNAI-600032	044-49681447	
EARTH LEAKAGE CB	4	S03	SCHNEIDER ELECTRIC INDIA PVT. LTD.	9TH FLOOR, BLDG. NO. 10, TOWER-C, DLF CYBER CITY, PH-II, GURGAON-122002	0124-3940400	

5 X 800 MW YADADRI TPS TECHNICAL SPECIFICATION FOR BATTERY CHARGER
SECTION-II ANNEXURE-IV SUBVENDOR LIST

ITEM/SERVICE DESCRIPTION	SL NO.	VENDOR CODE	VENDOR NAME	ADDRESS	PHONE	REMARKS
EARTH LEAKAGE CB	5	C01	C&S ELECTRIC LTD.	222, OKHLA IND. ESTATE, PH-III, NEW DELHI-110020	011-3088 7520-29	
EARTH LEAKAGE CB	6	A24	ABB	14, MATHURA ROAD, FARIDABAD, HARYANA-121003	0129-2567580, 09871799449	
EARTH LEAKAGE CB	7	E1068	INDO ASIAN	B-24, PHASE - II , NOIDA - 201305, U.P.	120-3042222	
EARTH LEAKAGE CB	8	E1088	MDS SWITCHGEAR LTD	314-317SHAH NAHAR ESTATE	011 - 25793021	
EARTH LEAKAGE CB	9	E1120	S&S POWER SWITCHGEAR LTD,	NEW NO. 67, OLD NO. 19, DR. RANGA ROAD, MYLAPORE, CHENNAI - 600004	044 - 24988056, 044 - 24988057, 044 - 24988058	
DC CONTACTORS	1	S03	SCHNEIDER ELECTRIC INDIA PVT. LTD.	9TH FLOOR, BLDG. NO. 10, TOWER-C, DLF CYBER CITY, PH-II, GURGAON-122002	0124-3940400	
DC CONTACTORS	2	E1030	BHEL (BHOPAL)	HEAVY ELECTRICAL PLANT		
DC CONTACTORS	3	E1044	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	4	L01	L&T	32, SHIVAJI MARG, P.O. BOX- 6223, NEW DELHI-110015	011-41419554/59	
DC CONTACTORS	5	S01	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	6	E1144	TELEMECHANIQUE/ SCHNEIDER ELECTRIC INDIA PVT. LTD.	9TH FLOOR, BLDG. NO. 10, TOWER-C, DLF CYBER CITY, PH-II, GURGAON-122002	0124-3940400	TAKEN OVER BYSCHNEIDER
DC CONTACTORS	7	A35	GE-POWER	KAMAK TOWER, 3RD FLOOR, PLOT NO. 12-A, TVK INDUSTRIAL ESTATE, EKKADUTHANGAL, GUINDY, CHENNAI-600032	044-49681447	
CONTROL SWITCHES/ SELECTOR SWITCH	1	E1076	KAYCEE	KAYCEE INDUSTRIES LTD., C/O-CMS COMPUTERSLTD., 35A, REAR BLDG., KILOKARI, NEW DELH1-110014	Rajiv Sharma-9312004687	
CONTROL SWITCHES/ SELECTOR SWITCH	2	A35	GE-POWER	KAMAK TOWER, 3RD FLOOR, PLOT NO. 12-A, TVK INDUSTRIAL ESTATE, EKKADUTHANGAL, GUINDY, CHENNAI-600032	044-49681447	
CONTROL SWITCHES/ SELECTOR SWITCH	3	G01	ALSTOM LTD	A-7, SEC-65, NOIDA	0120-479000	
CONTROL SWITCHES/ SELECTOR SWITCH	4	S03	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	5	SRC01	M/s Shrenik & Co.	39A/3, PANCHRATNA INDUSTRIAL ESTATE, SARKHEJ-BAVLA ROAD, CHANGODAR,		
CONTROL SWITCHES/ SELECTOR SWITCH	6	RE05	RECOM PVT. LTD.	M/S RECOM PVT. LTD.,16A , 2ND FLOOR A, WING RAJ INDUSTRIAL COMPLEX, MILITARY	Mr. Chandrashekar Kamath (MD) : 09820249503	
CONTROL TRANSFORMER/ WINDING HEATING TRANSFORMER	1	E1009	AUTOMATIC ELECTRIC LTD.	96 AB LONAVLA INDUSTRIAL ESTATE NANGARGAON, LONAVLA-410401	Phone : +91 2114323665 Fax : +91 2114273482	

5 X 800 MW YADADRI TPS TECHNICAL SPECIFICATION FOR BATTERY CHARGER
SECTION-II ANNEXURE-IV SUBVENDOR LIST

ITEM/SERVICE DESCRIPTION	SL NO.	VENDOR CODE	VENDOR NAME	ADDRESS	PHONE	REMARKS
CONTROL TRANSFORMER/ WINDING HEATING TRANSFORMER	2	E1066	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	3	K18	KAPPA ELECTRICALS	KAPPA ELECTRICALS, KAPPA CONSOLIDATED PVT. LTD., 14, CART TRACK ROAD, MADUVANKARAI, CHENNAI - 600 042, INDIA.	PHONE: +91 - 44 - 22454709, 22454516, 22450794, 22450795 FAX: +91 - 44 - 22351662, 22451693 E-MAIL: mira@kappaelectricals.com sales@kappaelectricals.com	
CONTROL TRANSFORMER/ WINDING HEATING TRANSFORMER	4	E1082	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	5	E1106	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	6	E1128	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	7	NK09	M/s Newtek Electricals	M-90, M.I.D.C, Waluj, Aurangabad 431136, Maharashtra, India	Tel/Fax: +91 240 2551555 E-mail: mkt.north@newtekelectricals.com, sales@newtekelectricals.com Mr Sanjeev Aggarwal (9958897890)	FOR CONTROL TRANSFORMER ONLY
LT- CURRENT TRANSFORMER	1	S01	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	2	E1009	AUTOMATIC ELECTRIC LTD.	96 AB LONAVLA INDUSTRIAL ESTATE NANGARGAON, LONAVLA-410401	Phone : +91 2114323665 Fax : +91 2114273482	
LT- CURRENT TRANSFORMER	3	E1066	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	

ITEM/SERVICE DESCRIPTION	SL NO.	VENDOR CODE	VENDOR NAME		ADDRESS	PHONE	REMARKS
LT- CURRENT TRANSFORMER	4	K18	KAPPA ELECTRICALS		KAPPA ELECTRICALS, KAPPA CONSOLIDATED PVT. LTD.,SOUTHERN ELECTRIKS 14, CART TRACK ROAD, MADUVANKARAI,CHENNAI - 600 042, INDIA.	PHONE: +91 - 44 - 22454709, 22454516, 22450794, 22450795 FAX: +91 - 44 - 22351662, 22451693 E-MAIL: mira@kappaelectricals.com sales@kappaelectricals.com	
LT- CURRENT TRANSFORMER	5	E1104	PRAGATI ELECTRICALS		280/3,II POKHRAN RD	5341779,5427041	
LT- CURRENT TRANSFORMER	6	E1106	PRECISE ELECTRICALS		47A-49A,CHAKALA ROAD ANDHERI(E),MUMBAI-99 MUMBAI, MAHARASHTRA, INDIA PIN-400 099	022-8323402 / 022-8216433	
LT- CURRENT TRANSFORMER	7	E1128	SILKAANS ELECT.MFG.CO.PVT.LTD		PLOT NO: R-247, T.T.C. INDUSTRIALAREA, M.I.D.C , RABALE, NAVI MUMBAI- 400 701 INDIA	+91-22- 27607787 / 27607927 +91-22- 27607997	
LT- CURRENT TRANSFORMER	8	E1111	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	9	C01	C&S ELECTRIC LTD.		222, OKHLA IND. ESTATE, PH-III, NEW DELHI-110020	011-3088 7520-29	
LT- CURRENT TRANSFORMER	10	NK09	M/s Newtek Electricals		M-90, M.I.D.C, Waluj, Aurangabad 431136,Maharashtra, India	Tel/Fax: +91 240 2551555 E-mail: mkt.north@newtekelectricals.com,sales@newtekelectricals.com Mr Sanjeev Aggarwal (9958897890)	
LT- POTENTIAL TRANSFORMER	1	S01	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	2	E1009	AUTOMATIC ELECTRIC LTD.		96 AB LONAVLA INDUSTRIAL ESTATE NANGARGAON, LONAVLA-410401	Phone : +91 2114323665 Fax : +91 2114273482	
LT- POTENTIAL TRANSFORMER	3	E1066	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	4	K18	KAPPA ELECTRICALS		KAPPA ELECTRICALS, KAPPA CONSOLIDATED PVT. LTD.,SOUTHERN ELECTRIKS 14, CART TRACK ROAD, MADUVANKARAI,CHENNAI - 600 042, INDIA.	PHONE: +91 - 44 - 22454709, 22454516, 22450794, 22450795 FAX: +91 - 44 - 22351662, 22451693 E-MAIL: mira@kappaelectricals.com sales@kappaelectricals.com	

5 X 800 MW YADADRI TPS TECHNICAL SPECIFICATION FOR BATTERY CHARGER
SECTION-II ANNEXURE-IV SUBVENDOR LIST

ITEM/SERVICE DESCRIPTION	SL NO.	VENDOR CODE	VENDOR NAME	ADDRESS	PHONE	REMARKS
LT- POTENTIAL TRANSFORMER	5	E1104	PRAGATI ELECTRICALS	280/3,II POKHRAN RD	5341779,5427041	
LT- POTENTIAL TRANSFORMER	6	E1106	PRECISE ELECTRICALS	47A-49A,CHAKALA ROAD ANDHERI(E),MUMBAI-99 MUMBAI, MAHARASHTRA, INDIA PIN-400 099	022-8323402 / 022-8216433	
LT- POTENTIAL TRANSFORMER	7	E1128	SILKAANS ELECT.MFG.CO.PVT.LTD	PLOT NO: R-247, T.T.C. INDUSTRIALAREA, M.I.D.C , RABALE, NAVI MUMBAI- 400 701 INDIA	+91-22- 27607787 / 27607927 +91-22- 27607997	
LT- POTENTIAL TRANSFORMER	8	E1111	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	9	NK09	M/s Newtek Electricals	M-90, M.I.D.C, Waluj, Aurangabad 431136, Maharashtra, India	Tel/Fax: +91 240 2551555 E-mail: mkt.north@newtekelectricals.com, sales@newtekelectricals.com Mr Sanjeev Aggarwal (9958897890)	
DC SWITCH	1	A35	GE-POWER	KAMAK TOWER, 3RD FLOOR, PLOT NO. 12-A,TVK INDUSTRIAL ESTATE, EKKADUTHANGAL, GUINDY, CHENNAI-600032	044-49681447	
DC SWITCH	2	E1076	KAYCEE	KAYCEE INDUSTRIES LTD., C/O-CMS COMPUTERSLTD., 35A, REAR BLDG., KILOKARI, NEW DELH1-110014	Rajiv Sharma-9312004687	
DC SWITCH	3	S01	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	
FUSE BASE	1	E1068	INDO ASIAN	B-24, PHASE - II , NOIDA - 201305, U.P.	120-3042222	
FUSE BASE	2	G01	GE-POWER	KAMAK TOWER, 3RD FLOOR, PLOT NO. 12-A,TVK INDUSTRIAL ESTATE, EKKADUTHANGAL, GUINDY, CHENNAI-600032	044-49681447	
FUSE BASE	3	L01	L&T	32, SHIVAJI MARG, P.O. BOX- 6223, NEW DELHI-110015	011-41419554/59	
FUSE BASE	4	C01	C&S ELECTRIC LTD.	222, OKHLA IND. ESTATE, PH-III, NEW DELHI-110020	011-3088 7520-29	
FUSE BASE	5	S01	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	

ITEM/SERVICE DESCRIPTION	SL NO.	VENDOR CODE	VENDOR NAME	ADDRESS	PHONE	REMARKS
FUSE BASE	6	A24	ABB	14, MATHURA ROAD, FARIDABAD, HARYANA- 121003	0129-2567580, 09871799449	
FUSE BASE	7	S02	SPACEAGE SWITCHGEARSLTD.	68 & 13-A INDUSTRIAL DEVELOPMENT COLONY,MEHRAULI ROAD GURGAON, HARYANA-122001	0124-2302711, 4085091	
FUSE BASE	8	S03	SCHNEIDER ELECTRIC INDIAPVT. LTD.	9TH FLOOR, BLDG. NO. 10, TOWER-C, DLF CYBERCITY, PH-II, GURGAON-122002	0124-3940400	
FUSE BASE	9	G01	ALSTOM LTD	A-7, SEC-65, NOIDA	0120-479 0000	
FUSE BASE	10	E1050	ESSEN DEINKI	FLAT NO. 502, SKYLINE HOUSE 85, NEHRU PLACENEW DELHI	011-26217060	
HRC FUSES	1	E1068	INDO ASIAN	B-24, PHASE - II , NOIDA - 201305, U.P.	120-3042222	
HRC FUSES	2	G01	GE-POWER	KAMAK TOWER, 3RD FLOOR, PLOT NO. 12-A,TVK INDUSTRIAL ESTATE, EKKADUTHANGAL, GUINDY, CHENNAI-600032	044-49681447	
HRC FUSES	3	L01	L&T	32, SHIVAJI MARG, P.O. BOX- 6223, NEW DELHI- 110015	011-41419554/59	
HRC FUSES	4	C01	C&S ELECTRIC LTD.	222, OKHLA IND. ESTATE, PH-III, NEW DELHI- 110020	011-3088 7520-29	
HRC FUSES	5	S01	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	6	A24	ABB	14, MATHURA ROAD, FARIDABAD, HARYANA- 121003	0129-2567580, 09871799449	
HRC FUSES	7	S02	SPACEAGE SWITCHGEARSLTD.	68 & 13-A INDUSTRIAL DEVELOPMENT COLONY,MEHRAULI ROAD GURGAON, HARYANA-122001	0124-2302711, 4085091	
HRC FUSES	8	S03	SCHNEIDER ELECTRIC INDIA PVT. LTD.	9TH FLOOR, BLDG. NO. 10, TOWER-C, DLF CYBER CITY, PH-II, GURGAON-122002	0124-3940400	
HRC FUSES	9	G01	ALSTOM LTD	A-7, SEC-65, NOIDA	0120-479 0000	
HRC FUSES	10	E1050	ESSEN DEINKI	FLAT NO. 502, SKYLINE HOUSE 85, NEHRU PLACE NEW DELHI	011-26217060	
INTERPOSING RELAY	1	A24	ABB	14, MATHURA ROAD, FARIDABAD, HARYANA- 121003	0129-2567580, 09871799449	
INTERPOSING RELAY	2	G01	ALSTOM LTD	A-7, SEC-65, NOIDA	0120-479 0000	

5 X 800 MW YADADRI TPS TECHNICAL SPECIFICATION FOR BATTERY CHARGER
SECTION-II ANNEXURE-IV SUBVENDOR LIST

ITEM/SERVICE DESCRIPTION	SL NO.	VENDOR CODE	VENDOR NAME	ADDRESS	PHONE	REMARKS
INTERPOSING RELAY	3	E1075	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	4	E1099	OEN INDIA LTD	29/1479, VYTILLA, COCHIN - 682 019KERALA, INDIA	Phone : +91 484 2301132, 2303709 Fax : +91 484 2302287, 2302221 sales@oenindia.com	
INTERPOSING RELAY	5	S01	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	1	B04	BCH	20/4, MATHURA ROAD, FARIDABAD, HARYANA- 121006	0129-4293000	
INDICATING LAMPS	2	C01	C&S ELECTRIC LTD.	222, OKHLA IND. ESTATE, PH-III, NEW DELHI- 110020	6832259,6918834-37	
INDICATING LAMPS	3	E1050	ESSEN DEINKI	FLAT NO. 502, SKYLINE HOUSE 85, NEHRU PLACE NEW DELHI	011-26217060	
INDICATING LAMPS	4	E1153	VAISHNO(HOTLINE SWGR.& CONTROL)	G-19, SECTOR - 11, NOIDA - 201301, UTTAR PRADESH, INDIA	8377805157 9818338922	
INDICATING LAMPS	5	A35	GE-POWER	KAMAK TOWER, 3RD FLOOR, PLOT NO. 12-A, TVK INDUSTRIAL ESTATE, EKKADUTHANGAL, GUINDY, CHENNAI-600032	9818338922	
INDICATING LAMPS	6	S01	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	7	S03	SCHNEIDER ELECTRIC INDIA PVT. LTD.	9TH FLOOR, BLDG. NO. 10, TOWER-C, DLF CYBER CITY, PH-II, GURGAON-122002	0124-3940400	

ITEM/SERVICE DESCRIPTION	SL NO.	VENDOR CODE	VENDOR NAME	ADDRESS	PHONE	REMARKS
MCB	1	E1088	MDS SWITCHGEAR LTD	314-317SHAH NAHAR ESTATE	011 - 25793021	
MCB	2	E1068	INDO ASIAN	B-24, PHASE - II , NOIDA - 201305, U.P.	120-3042222	
MCB	3	S03	SCHNEIDER ELECTRIC INDIA PVT. LTD.	9TH FLOOR, BLDG. NO. 10, TOWER-C, DLF CYBER CITY, PH-II, GURGAON-122002	0124-3940400	
MCB	4	E1120	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)	1	S01	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)	2	S03	SCHNEIDER ELECTRIC INDIA PVT. LTD.	9TH FLOOR, BLDG. NO. 10, TOWER-C, DLF CYBER CITY, PH-II, GURGAON-122002	0124-3940400	
PROTECTION - RELAYS (PNUEMATIC)	3	A35	GE-MULTILINE, GE INDIA INDUSTRIAL PVT. LTD.	NO. 90- B, ELECTRONICS CITY, HOSUR ROAD, BENGALURU - 560016, KARNATAKA	(080) 41314617, 9945478935	
PROTECTION - RELAYS (PNUEMATIC)	4	SC01	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)	5	C01	C&S ELECTRIC LTD.	222, OKHLA IND. ESTATE, PH-III, NEW DELHI-110020	011-3088 7520-29	
PROTECTION - RELAYS (PNUEMATIC)	6	G01	ALSTOM LTD	A-7, SEC-65, NOIDA	0120-479 0000	
PROTECTION - RELAYS (PNUEMATIC)	7	A24	ABB	14, MATHURA ROAD, FARIDABAD, HARYANA-121003	0129-2567580, 09871799449	
PROTECTION - RELAYS (PNUEMATIC)	8	C01	AVK-SEG & CONTROLS(I) LTD	C-60,NOIDA PHASE-II	6918834-37	
PROTECTION - RELAYS (NUMERICAL)	1	S01	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)	2	S03	SCHNEIDER ELECTRIC INDIA PVT. LTD.	9TH FLOOR, BLDG. NO. 10, TOWER-C, DLF CYBER CITY, PH-II, GURGAON-122002	0124-3940400	
PROTECTION - RELAYS (NUMERICAL)	3	A35	GE-MULTILINE, GE INDIA INDUSTRIAL PVT. LTD.	NO. 90- B, ELECTRONICS CITY, HOSUR ROAD, BENGALURU - 560016, KARNATAKA	(080) 41314617, 9945478935	
PROTECTION - RELAYS (NUMERICAL)	4	SC01	SCHWEITZER ENGG. LAB (SEL)	406, BHIKAJI CAMA BHAVAN, BHIKAJI CAMA PLACE, BHIKAJI CAMA PLACE, MOHAMMADPUR, RK PURAM, NEW DELHI, DL 110066	011 4152 7899	
TERMINAL BLOCKS	1	C01	WAGO-CONTROLS	C 27, GREATER NOIDA, SECTOR 58, C BLOCK, SECTOR 58, NOIDA, UTTAR PRADESH 201307	0120-2580409/10	
TERMINAL BLOCKS	2	E1038	CONNECT WELL	309A/4, 3RD FLOOR, KALKAJI, OKHLA IND AREA PH-2, GOVINDPURI, NEW DELHI, DL 110019	9811881085 09871419996 011-65908877	
TERMINAL BLOCKS	3	E1047	ELMEX CONTROLS PVT. LTD.	12,G.I.D.C.ESTATE,MUKARPURA ROAD,VADODARA-390010	9374631074	

ITEM/SERVICE DESCRIPTION	SL NO.	VENDOR CODE	VENDOR NAME	ADDRESS	PHONE	REMARKS
TERMINAL BLOCKS	4	E1050	ESSEN DEINKI	FLAT NO. 502, SKYLINE HOUSE 85, NEHRU PLACE NEW DELHI	011-26217060	
TERMINAL BLOCKS	5	E1142	TECHNOPLAST	OPP.I.M.INTER COLLEGE, BEGUM SARAI KHURDROAD, AMROHA - 244221, U.P.	PH:- 05922 264006 CELL NO:- 9012676000, 9319520799, 9319582467	
TERMINAL BLOCKS	6	PME-01	M/s PHOENIX MECANO LTD.,	388 BHARE, TALUKA MULSHI, POST GHOTAWADE, PIRANGOOT, INDUSTRIAL AREA,PUNE-412115	TEL.- +912066745000 Awasthi(09971119006) Tel: ++91 20 6674 5103, Mobile: +91 90499 95985, Fax: ++91 20 6674 5126 contact person : Vishwa bandhu E-mail:d.gupta@pmipl-online.com ;admin@pmipl-online.com	
TERMINAL BLOCKS	7	E1050	ESSEN DEINKI	FLAT NO. 502, SKYLINE HOUSE 85, NEHRU PLACE NEW DELHI	011-26217060	
TIMERS - PNEUMATIC	1	B04	BCH	20/4, MATHURA ROAD, FARIDABAD, HARYANA- 121006	0129-4293000	
TIMERS - PNEUMATIC	2	G01	ALSTOM LTD	A-7, SEC-65, NOIDA	0120-479 0000	
TIMERS - PNEUMATIC	3	L01	L&T	32, SHIVAJI MARG, P.O. BOX- 6223, NEW DELHI- 110015	011-41419554/59	
TIMERS - PNEUMATIC	4	E1144	TELEMECHANIQUE/ SCHNEIDER ELECTRIC INDIA PVT. LTD.	9TH FLOOR, BLDG. NO. 10, TOWER-C, DLF CYBERCITY, PH-II, GURGAON-122002	0124-3940400	TAKEN OVER BY SCHNEIDER
TIMERS - PNEUMATIC	5	S03	SCHNEIDER ELECTRIC INDIA PVT. LTD.	9TH FLOOR, BLDG. NO. 10, TOWER-C, DLF CYBER CITY, PH-II, GURGAON-122002	0124-3940400	
TIMERS - PNEUMATIC	6	E01	ELECTRONIC AUTOMATIONPVT. LTD.	20, KHB INDUSTRIAL AREA YELAHANKABANGLORE-560064	080 -28567561 / 080 -28567562 / 080 -42802345	
TIMERS - ELECTRONIC	1	E1050	ESSEN DEINKI	FLAT NO. 502, SKYLINE HOUSE 85, NEHRU PLACE NEW DELHI	011-26217060	
TRANSDUCERS	1	E1021	AUTOMATIC ELECTRIC LTD.	ADDRESS : 96 AB LONAVLA INDUSTRIAL ESTATENANGARGAON, LONAVLA-410401	Phone : +91 2114323665 Fax : +91 2114273482	
TRANSDUCERS	2	E1202	SOUTHERN TRANSDUCERS	INTERTECH B-83, FLATTED FACTORY COMPLEX, NEAR MODI MILLS, OKHLA, NEW DELHI-110020	Mr. Gurmohit Singh 011-41020365 / 9891402128	
ENERGY METER (ANALOG)	1	B07	BHEL (EDN)	MYSORE ROAD,BANGALORE-560026	080-26998500	
ENERGY METER (ANALOG)	2	E1129	SIMCO ENGG. LTD	NO. 126, K ROAD, TIRUCHIRAPPALLI - 620001,TAMIL NADU	Mr. Madaswamy Muthu +(91)-(431)-4046223 +(91)-(431)-4046210 +(91)-9786600915	

5 X 800 MW YADADRI TPS TECHNICAL SPECIFICATION FOR BATTERY CHARGER
SECTION-II ANNEXURE-IV SUBVENDOR LIST

ITEM/SERVICE DESCRIPTION	SL NO.	VENDOR CODE	VENDOR NAME	ADDRESS	PHONE	REMARKS
ENERGY METER (ANALOG)	3	R01	RISHABH INST.PVT LTD	RISHABH INSTRUMENTS PVT. LTD.F-31, MIDC, SATPUR NASHIK - 422007 MAHARASHTRA INDIA	marketing@rishabh.co.in 91-253 2202202/203 Fax: 91 253 2351064	
ENERGY METER (ANALOG)	4	E1009	AUTOMATIC ELECTRIC LTD.	96 AB LONAVLA INDUSTRIAL ESTATE NANGARGAON, LONAVLA-410401	Phone : +91 2114323665 Fax : +91 2114273482	
ENERGY METER (ANALOG)	5	CON1	CONZERVE SYSTEMS PVT.LTD.(SCHNEIDER)	87, 1ST FLOOR INDUSTRIAL DEVELOPMENT COLONY (IDC) MEHRAULI ROAD, UGURGAON122001 HARYANA, INDIA.	4178899, 9910695701	
ENERGY METER (DIGITAL)	1	CON1	CONZERVE SYSTEMS PVT.LTD.(SCHNEIDER)	87, 1ST FLOOR INDUSTRIAL DEVELOPMENT COLONY (IDC) MEHRAULI ROAD, UGURGAON122001 HARYANA, INDIA.	4178899, 9910695701	
ENERGY METER (DIGITAL)	2	NK09	M/s Newtek Electricals	M-90, M.I.D.C, Waluj, Aurangabad 431136, Maharashtra, India	Tel/Fax: +91 240 2551555 E-mail: mkt.north@newtekelectricals.com, sales@newtekelectricals.com Mr Sanjeev Aggarwal (9958897890)	
AMMETER	1	E1009	AUTOMATIC ELECTRIC LTD.	96 AB LONAVLA INDUSTRIAL ESTATE NANGARGAON, LONAVLA-410401	Phone : +91 2114323665 Fax : +91 2114273482	
AMMETER	2	R01	RISHABH INST.PVT LTD	RISHABH INSTRUMENTS PVT. LTD.F-31, MIDC, SATPUR NASHIK - 422007 MAHARASHTRA INDIA	marketing@rishabh.co.in 91-253 2202202/203 Fax: 91 253 2351064	
AMMETER	3	NK09	M/s Newtek Electricals	M-90, M.I.D.C, Waluj, Aurangabad 431136, Maharashtra, India	Tel/Fax: +91 240 2551555 E-mail: mkt.north@newtekelectricals.com, sales@newtekelectricals.com Mr Sanjeev Aggarwal (9958897890)	
VOLTMETER	1	E1009	AUTOMATIC ELECTRIC LTD.	96 AB LONAVLA INDUSTRIAL ESTATE NANGARGAON, LONAVLA-410401	Phone : +91 2114323665 Fax : +91 2114273482	
	2	R01	RISHABH INST.PVT LTD	RISHABH INSTRUMENTS PVT. LTD.F-31, MIDC, SATPUR NASHIK - 422007 MAHARASHTRA INDIA	marketing@rishabh.co.in 91-253 2202202/203 Fax: 91 253 2351064	
VOLTMETER	3	NK09	M/s Newtek Electricals	M-90, M.I.D.C, Waluj, Aurangabad 431136, Maharashtra, India	Tel/Fax: +91 240 2551555 E-mail: mkt.north@newtekelectricals.com, sales@newtekelectricals.com Mr Sanjeev Aggarwal (9958897890)	
MPCB	1	S03	SCHNEIDER ELECTRIC INDIA PVT. LTD.	9TH FLOOR, BLDG. NO. 10, TOWER-C, DLF CYBER CITY, PH-II, GURGAON-122002	0124-3940400	

5 X 800 MW YADADRI TPS TECHNICAL SPECIFICATION FOR BATTERY CHARGER
SECTION-II ANNEXURE-IV SUBVENDOR LIST

ITEM/SERVICE DESCRIPTION	SL NO.	VENDOR CODE	VENDOR NAME	ADDRESS	PHONE	REMARKS
MPCB	2	L01	L&T	32, SHIVAJI MARG, P.O. BOX- 6223, NEW DELHI-110015	011-41419554/59	
MPCB	3	S01	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	
MPCB	4	A35	GE-POWER	KAMAK TOWER, 3RD FLOOR, PLOT NO. 12-A, TVK INDUSTRIAL ESTATE, EKKADUTHANGAL, GUINDY, CHENNAI-600032	044-49681447	
MPCB	5	S03	SCHNEIDER ELECTRIC INDIA PVT. LTD.	9TH FLOOR, BLDG. NO. 10, TOWER-C, DLF CYBER CITY, PH-II, GURGAON-122002	0124-3940400	
MPCB	6	C01	C&S ELECTRIC LTD.	222, OKHLA IND. ESTATE, PH-III, NEW DELHI-110020	011-3088 7520-29	
MULTIFUNCTION METER	1	CON1	CONZERVE SYSTEMS PVT. LTD./ SCHNEIDER ELECTRIC INDIA PVT. LTD.	87, 1ST FLOOR INDUSTRIAL DEVELOPMENT COLONY (IDC) MEHRAULI ROAD, GURGAON 122001 HARYANA, INDIA.	4178899, 9910695701	TAKEN OVER BYSCHNEIDER
MULTIFUNCTION METER	2	NK09	M/s Newtek Electricals	M-90, M.I.D.C, Waluj, Aurangabad 431136, Maharashtra, India	Tel/Fax: +91 240 2551555 E-mail: mkt.north@newtekelectricals.com, sales@newtekelectricals.com Mr Sanjeev Aggarwal (9958897890)	
RCCB	1	C01	C&S ELECTRIC LTD.	222, OKHLA IND. ESTATE, PH-III, NEW DELHI-110020	011-3088 7520-29	
RCCB	2	S03	SCHNEIDER ELECTRIC INDIA PVT. LTD.	9TH FLOOR, BLDG. NO. 10, TOWER-C, DLF CYBER CITY, PH-II, GURGAON-122002	0124-3940400	
RCCB	3	S01	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	
RCCB	4	A35	GE-POWER	KAMAK TOWER, 3RD FLOOR, PLOT NO. 12-A, TVK INDUSTRIAL ESTATE, EKKADUTHANGAL, GUINDY, CHENNAI-600032	044-49681447	
RCCB	5	L01	L&T	32, SHIVAJI MARG, P.O. BOX- 6223, NEW DELHI-110015	011-41419554/59	
RCCB	6	C02	CROMPTON GREAVES	RAIL TRANSPORTATION SYSTEMS,VANDANA BUILDING, 11, TOLSTOY MARG, TOLSTOY MARG, NEW DELHI, DL 110001	011 3041 6300	
VAF METER (DIGITAL)	1	NK09	M/s Newtek Electricals	M-90, M.I.D.C, Waluj, Aurangabad 431136, Maharashtra, India	Tel/Fax: +91 240 2551555 E-mail: mkt.north@newtekelectricals.com, sales@newtekelectricals.com Mr Sanjeev Aggarwal (9958897890)	

	MANUFACTURER/ BIDDER/ SUPPLIER NAME & ADDRESS	STANDARD QUALITY PLAN			SPEC NO.:-PE-TS-XXX-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 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			

KANHAIYA KUMAR
Digitally signed by KANHAIYA KUMAR
DN: cn=KANHAIYA KUMAR, o=BHEL, ou=PEM, email=kanhaiya.kumar@bhel.in, c=IN
Date: 2020.08.28 12:43:46 +05'30'

MANISH
Digitally signed by MANISH
DN: cn=MANISH, o=BHEL, ou=PEM, email=manishshukla@bhel.in, c=IN
Date: 2020.08.28 14:49:59 +05'30'

Digitally signed by Kunal
DN: cn=Kunal, o, ou, email=kunalgandhi@bhel.in, c=IN
Date: 2020.08.28 15:04:32 +05'30'

RITESH KUMAR JAISWAL
Digitally signed by RITESH KUMAR JAISWAL
DN: c=IN, o=Bharat Heavy Electricals Ltd, ou=BHEL / PS-PEM, postalCode=201301, st=Uttar Pradesh, 2.5.4.20=16692a281523bf78b46a8e18c5cd0bb189777532609b5349ae8d7191a9e51174, serialNumber=8cfaddf001b4875a8b03a31b000e93ff006304f82c650e6d5f9ef9980e09bc448, cn=RITESH KUMAR JAISWAL
Date: 2020.08.28 16:15:13 +05'30'

MANUFACTURER/ BIDDER/ SUPPLIER NAME & ADDRESS	STANDARD QUALITY PLAN			SPEC NO.:-PE-TS-XXX-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 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	Seal			Sign & Date	Name	Seal
Prepared By		Kanhaiya Kumar	Prepared By		Kunal Gandhi			Reviewed By			
Checked By		Manish Shukla	Checked By		Ritesh K Jaiswal			Checked By			

KANHAIYA KUMAR
Digitally signed by KANHAIYA KUMAR
DN: cn=KANHAIYA KUMAR, o=BHEL, ou=PEM, email=kanhaiya.kumar@bhel.in, c=IN
Date: 2020.08.28 12:44:18 +05'30'

MANISH
Digitally signed by MANISH
DN: cn=MANISH, o=BHEL, ou=PEM, email=manishshukla@bhel.in, c=IN
Date: 2020.08.28 14:50:25 +05'30'

Digitally signed by Kunal
DN: cn=Kunal, o, ou, email=kunalgandhi@bhel.in, c=IN
Date: 2020.08.28 15:04:53 +05'30'

RITESH KUMAR JAISWAL
Digitally signed by RITESH KUMAR JAISWAL
DN: c=IN, o=Bharat Heavy Electricals Ltd, ou=BHEL / PS-PEM, postalCode=201301, st=Uttar Pradesh, 2.5.4.20=16692a281523bf78b46a8e18c5cd0bb189777532609b5349ae8d7191a9e51174, serialNumber=8cfaddf001b4875a8b03a31b000e93ff205304f62c650e6d5f9d9980e09bc448, cn=RITESH KUMAR JAISWAL
Date: 2020.08.28 16:16:01 +05'30'

MANUFACTURER/ BIDDER/ SUPPLIER NAME & ADDRESS	STANDARD QUALITY PLAN			SPEC NO.:-PE-TS-XXX-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 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			
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			

KANHAIYA KUMAR
Digitally signed by KANHAIYA KUMAR
DN: cn=KANHAIYA KUMAR, o=BHEL, ou=PEM, email=kanhaiya.kumar@bhel.in, c=IN
Date: 2020.08.28 12:44:47 +05'30'

MANISH
Digitally signed by MANISH
DN: cn=MANISH, o=BHEL, ou=PEM, email=manishshukla@bhel.in, c=IN
Date: 2020.08.28 14:50:51 +05'30'

Digitally signed by Kunal
DN: cn=Kunal, o, ou, email=kunalgandhi@bhel.in, c=IN
Date: 2020.08.28 15:07:28 +05'30'

RITESH KUMAR JAISWAL
Digitally signed by RITESH KUMAR JAISWAL
DN: c=IN, o=Bharat Heavy Electricals Ltd, ou=BHEL / PS-PEM, postalCode=201301, st=Uttar Pradesh, 2.5.4.20=16692a281523bf78b46a8e18c5cd0bb189777532609b5349ae8d7191a9e51174, serialNumber=8cfaddf001b4875a8b03a31b000e93ff205304f62c650e6d5f9d9980e09bc448, cn=RITESH KUMAR JAISWAL
Date: 2020.08.28 16:16:50 +05'30'

	MANUFACTURER/ BIDDER/ SUPPLIER NAME & ADDRESS	STANDARD QUALITY PLAN						SPEC NO.:-PE-TS-XXX-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 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 *	M	C	N	11
					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	-	-	

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

KANHAIYA KUMAR
Digitally signed by KANHAIYA KUMAR
DN: cn=KANHAIYA KUMAR, o=BHEL, ou=PEM, email=kanhaiya.kumar@bhel.in, c=IN
Date: 2020.08.28 12:45:14 +05'30'

MANISH
Digitally signed by MANISH
DN: cn=MANISH, o=BHEL, ou=PEM, email=manishshukla@bhel.in, c=IN
Date: 2020.08.28 14:51:20 +05'30'

Digitally signed by Kunal
DN: cn=Kunal, o, ou, email=kunalgandhi@bhel.in, c=IN
Date: 2020.08.28 15:07:45 +05'30'

RITESH KUMAR JAISWAL
Digitally signed by RITESH KUMAR JAISWAL
DN: c=IN, o=Bharat Heavy Electricals Ltd, ou=BHEL / PS-PEM, postalCode=201301, st=Uttar Pradesh, 2.5.4.20=16692a281523bf78b46a8e18c5cd0b b1897775326098b5349ae8d7191a9e51174, serialNumber=8cfaddf001b4875a8b03a31b0 00e93ff205304f62c650e6d5f9d9980e09bc44 8, cn=RITESH KUMAR JAISWAL
Date: 2020.08.28 16:17:28 +05'30'

MANUFACTURER/ BIDDER/ SUPPLIER NAME & ADDRESS	STANDARD QUALITY PLAN			SPEC NO.:-PE-TS-XXX-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 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	-	-	

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

KANHAIYA KUMAR
Digitally signed by KANHAIYA KUMAR
DN: cn=KANHAIYA KUMAR, o=BHEL, ou=PEM, email=kanhaiya.kumar@bhel.in, c=IN
Date: 2020.08.28 12:45:52 +05'30'

MANISH
Digitally signed by MANISH
DN: cn=MANISH, o=BHEL, ou=PEM, email=manishshukla@bhel.in, c=IN
Date: 2020.08.28 14:51:46 +05'30'

Digitally signed by Kunal
DN: cn=Kunal, o, ou, email=kunalgandhi@bhel.in, c=IN
Date: 2020.08.28 15:08:06 +05'30'

RITESH KUMAR JAISWAL
Digitally signed by RITESH KUMAR JAISWAL
DN: c=IN, o=Bharat Heavy Electricals Ltd, ou=BHEL / PS-PEM, postalCode=201301, st=Uttar Pradesh, 2.5.4.20=16692a281523bf78b46a8e18c5cd0b1b1897775326096b5349ae8d7191a9e51174, serialNumber=8cfacbdf001b4875a8b03a31b000e93ff205304f62c650e6d5f9d9980e09bc448, cn=RITESH KUMAR JAISWAL
Date: 2020.08.28 16:18:07 +05'30'

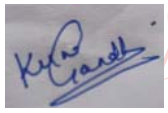
MANUFACTURER/ BIDDER/ SUPPLIER NAME & ADDRESS	STANDARD QUALITY PLAN			SPEC NO.:-PE-TS-XXX-508-E002	DATE:-
	CUSTOMER			QP NO.:-PE-QP-999-508-E003, REV.01	DATE:- 14/06/2020
	PROJECT			P.O NO.:-	DATE:-
	ITEM:- BATTERY CHARGER(SCR BASED)		SYSTEM:- DC SYSTEM	SECTION:-	SHEET 6 OF 9

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	

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			

KANHAIYA KUMAR
Digitally signed by KANHAIYA KUMAR
DN: cn=KANHAIYA KUMAR, o=BHEL, ou=PEM, email=kanhaiya.kumar@bhel.in, c=IN
Date: 2020.08.28 12:46:47 +05'30'

MANISH
Digitally signed by MANISH
DN: cn=MANISH, o=BHEL, ou=PEM, email=manishshukla@bhel.in, c=IN
Date: 2020.08.28 14:52:12 +05'30'


Digitally signed by Kunal
DN: cn=Kunal, o, ou, email=kunalgandhi@bhel.in, c=IN
Date: 2020.08.28 15:08:48 +05'30'

RITESH KUMAR JAISWAL
Digitally signed by RITESH KUMAR JAISWAL
DN: c=IN, o=Bharat Heavy Electricals Ltd, ou=BHEL / PS-PEM, postalCode=201301, st=Uttar Pradesh, 2.5.4.20=16692a281523bf78b46a8e18c5cd0bb189777532609b5349ae8d7191a9e51174, serialNumber=8cfaddf001b4875a8b03a31b000e93ff2053046f62c650e6d5f9d9980e09bc448, cn=RITESH KUMAR JAISWAL
Date: 2020.08.28 16:19:01 +05'30'

MANUFACTURER/ BIDDER/ SUPPLIER NAME & ADDRESS	STANDARD QUALITY PLAN			SPEC NO.:-PE-TS-XXX-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 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			
ENGGINEERING			QUALITY			Sign & Date		Doc No.			
	Sign & Date	Name		Sign & Date	Name	Seal			Sign & Date	Name	Seal
Prepared By		Kanhaiya Kumar	Prepared By		Kunal Gandhi			Reviewed By			
Checked By		Manish Shukla	Checked By		Ritesh K Jaiswal			Checked By			

KANHAIYA KUMAR
Digitally signed by KANHAIYA KUMAR
DN: cn=KANHAIYA KUMAR, o=BHEL, ou=PEM, email=kanhaiya.kumar@bhel.in, c=IN
Date: 2020.08.28 12:47:11 +05'30'

MANISH
Digitally signed by MANISH
DN: cn=MANISH, o=BHEL, ou=PEM, email=manishshukla@bhel.in, c=IN
Date: 2020.08.28 14:52:36 +05'30'

Digitally signed by Kunal
DN: cn=Kunal, o, ou, email=kunalgandhi@bhel.in, c=IN
Date: 2020.08.28 15:09:48 +05'30'

RITESH KUMAR JAISWAL
Digitally signed by RITESH KUMAR JAISWAL
DN: c=IN, o=Bharat Heavy Electricals Ltd, ou=BHEL / PS-PEM, postalCode=201301, st=Uttar Pradesh, 2.5.4.20=16692a281523bf78b46a8e18c5cd0bb189777532609b5349ae8d7191a9e51174, serialNumber=8cfaddf001b4875a8b03a31b000e93ff205304f62c650e6d5f9d9980e09bc448, cn=RITESH KUMAR JAISWAL
Date: 2020.08.28 16:20:08 +05'30'

MANUFACTURER/ BIDDER/ SUPPLIER NAME & ADDRESS	STANDARD QUALITY PLAN			SPEC NO.:-PE-TS-XXX-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	V	V	## If DOP test is to be conducted as per project specific Requirement, then Same shall be Witnessed ('W') by BHEL/Customer in place of Verification('V') under column 'C' and 'N' of AGENCY(10) Above
		13) Heat Run Test($$) for 8 Hrs.	MA	Electrical	Sample as per Remarks ($$)	Sample as per Remarks ($$)	Approved drg/ doc	Approved drg/ doc	-do-	√	P	V	V	$$ If Heat run test on defined sample(Project Specific Sample Plan) is to be conducted as per project specific Requirement, then Same shall be Witnessed ('W') by BHEL/Customer in place of Verification('V') under column 'C' and 'N' of AGENCY(10) Above

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

KANHAIYA KUMAR
Digitally signed by KANHAIYA KUMAR
DN: cn=KANHAIYA KUMAR, o=BHEL, ou=PEM, email=kanhaiya.kumar@bhel.in, c=IN
Date: 2020.08.28 12:47:36 +05'30'

MANISH
Digitally signed by MANISH
DN: cn=MANISH, o=BHEL, ou=PEM, email=manishshukla@bhel.in, c=IN
Date: 2020.08.28 14:53:02 +05'30'

Digitally signed by Kunal
DN: cn=Kunal, o, ou, email=kunalgandhi@bhel.in, c=IN
Date: 2020.08.28 15:10:34 +05'30'

RITESH KUMAR JAISWAL
Digitally signed by RITESH KUMAR JAISWAL
DN: c=IN, o=Bharat Heavy Electricals Ltd, ou=BHEL / PS-PEM, postalCode=201301, st=Uttar Pradesh, 2.5.4.20=16692a281523bf78b46a8e18c5cd0b b189777532609b5349ae8d7191a9e51174, serialNumber=8cfaddf001b4875a8b03a31b00 0e93ff205304f62c650e6d5f9d9980e09bc448, cn=RITESH KUMAR JAISWAL
Date: 2020.08.28 16:20:54 +05'30'

	MANUFACTURER/ BIDDER/ SUPPLIER NAME & ADDRESS	STANDARD QUALITY PLAN			SPEC NO.:-PE-TS-XXX-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 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 Packing drg/ doc($$)	Approved drg/ doc/ As Per Manufacturer Std./ Approved Packing drg/ doc($$)	-do-	√	P	W	-	($$)- Approved Packing Drg./ Doc Applicable for Export Job/Projects

NOTES:-

1. Wherever IS standard is mentioned, equivalent IEC/International standard is also acceptable as per applicability of test. In case of any technical requirement not covered by IEC, technical requirement as per IS shall prevail. 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			
ENGGINEERING			QUALITY			Sign & Date		Doc No.			
	Sign & Date	Name		Sign & Date	Name	Seal			Sign & Date	Name	Seal
Prepared By		Kanhaiya Kumar	Prepared By		Kunal Gandhi			Reviewed By			
Checked By		Manish Shukla	Checked By		Ritesh K Jaiswal			Checked By			

KANHAIYA KUMAR
Digitally signed by KANHAIYA KUMAR
DN: cn=KANHAIYA KUMAR, o=BHEL, ou=PEM, email=kanhaiya.kumar@bhel.in, c=IN
Date: 2020.08.28 12:48:01 +05'30'

MANISH
Digitally signed by MANISH
DN: cn=MANISH, o=BHEL, ou=PEM, email=manishshukla@bhel.in, c=IN
Date: 2020.08.28 14:53:27 +05'30'

Digitally signed by Kunal
DN: cn=Kunal, o, ou, email=kunalgandhi@bhel.in, c=IN
Date: 2020.08.28 15:11:31 +05'30'

RITESH KUMAR JAISWAL
Digitally signed by RITESH KUMAR JAISWAL
DN: c=IN, o=Bharat Heavy Electricals Ltd, ou=BHEL / PS-PEM, postalCode=201301, st=Uttar Pradesh, 2.5.4.20=16692a281523bf78b46a8e18c5cd0b b18977753260 9b5349ae8d7191a9e51174, serialNumber=8cfaddf001b4875a8b03a31b00 0e93ff20530 4f62c650e6d5f9d9980e09bc448, cn=RITESH KUMAR JAISWAL
Date: 2020.08.28 16:21:43 +05'30'