

KARNATAKA POWER TRANSMISSION CORPORATION LIMITED

SECTION- BATTERY CHARGER AND DCDB

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GENERAL**TECHNICAL****REQUIREMENTS**

- 1.1 All materials /components used in battery chargers and batteries shall be free from flaws and defects and shall conform to the relevant Indian/IEC standards and good engineering practice.
- 1.2 For 400 and 220kV Sub-stations, DC System shall consist of two (2) float chargers and 2 boost cum float chargers and two (2) battery sets for 220V systems. The standard scheme drawing is enclosed with this specification.
- 1.3 Bidder shall select number of cells, Float and Boost voltage, Float & Boost current to achieve following system requirement:

System Voltage	Maximum Voltage during Float operation	Minimum voltage available when no charger working and battery fully discharged upto 1.85V per cell.	Minimum Nos. of cell
220Volt	242 Volt	198 Volt	110

Bidder shall furnish calculation in support of battery sizing, selection of number of cells, float and Boost voltages, float & Boost current during detailed engineering for Owners acceptance. Battery sizing calculations shall be done as per IEEE-485 on the basis of following duty cycle:

	Load	Duration	Type of Loads
220V DC System	Continuous Load	6 Hours	Relays, IEDs, Station HMIs, spring charging, Isolator interlocking load, Miscellaneous permanently connected loads etc.
	Emergency Load	3 Hour	Substation emergency lighting loads
	Momentary Load	1 Minute	Breaker closing, Tripping loads (taking simultaneous occurrence as per system) and also Isolator closing and opening load.

Battery Charger shall be compatible for SCADA/ SAS system.

BATTERY

SPECIFICATION FOR 2 X 220 VOLTS, 645 AH BATTERY SETS

Void

**TECHNICAL SPECIFICATIONS FOR BATTERY CHARGERS
FOR- 220VOLTS, 645AH CAPACITY****3.1 Intent of Specification**

This section of the specification covers design, manufacture, testing, supply and supervision of erection and commissioning of battery charger with all materials and accessories required for various Stations of KPTCL for boost, float and trickle charging 220V, 645AH battery set & for distribution of DC supply to various equipments with efficient & trouble free operation.

3.2 Scope

3.2.1 The brief requirement for station is detailed below.

- a) A Charger – 1 panel consisting of a
 - i. Separate enclosure for boost cum float charger and separate float charger with trickle charging feature.
 - ii. Separate enclosure for switching cubicle.
 - iii. Stand alone DC Distribution board (DCDB) as detailed elsewhere in the specification. The DC Distribution board (DCDB) shall be compartmentalized type.

b) A Charger – 2 panel exactly similar to (a) above.

3.2.2 Each charger -1/charger -2 panel along with DCDB shall feed DC source1/ DC source 2 respectively. The battery charger together with the battery bank and DC distribution board shall constitute a 220V DC source for supply to various equipments in the main receiving stations. In addition to this, the charger shall be capable of being used for initial charging, trickle charging and equalizing charge as stipulated by battery manufacturer. The arrangement for end cell tapping, if required will be provided, so that while boost charging, the battery AC supply voltage fails or float charger feeding loads develops trouble, at least about 84 cells (84×2.62 Volts = 220V) are connected across the load and part of battery continue to meet the DC requirement till change over takes place and full battery is put across the load.

3.3 Codes & Standards

All the equipments and materials shall be manufactured and tested in accordance with the latest applicable standards as indicated in **Section GTR**.

3.4 Completeness Of Supply

It is not the intent to specify completely herein all details of equipments/ components. Nevertheless, the equipment shall be complete and operate in all aspects and shall conform of highest standard of engineering design and workmanship.

Any materials or accessories which may not have been specifically mentioned, but which is necessary or used for satisfactory and trouble free operation and maintenance of the equipment shall be furnished.

3.5 SERVICE CONDITION:

The battery charger and its associated accessories shall be designed for operation in the following climate condition.

i.	Maximum Temperature of Air in Shade	45°
ii.	Minimum Temperature of Air in Shade	50
iii.	Average Daily Ambient Air Temperature in Degree C.	650C
iv.	Maximum Relative Humidity	10-100%
v.	Altitude	Less than 100mm
vi.	Average rainfall	100-6000/5000mm
vii.	No. of rainy days per annum	100 Days (Max.)
viii.	Isoceraunic level days/year	46
ix.	Siesmic Level (Horizontal Acceleration)	0.3

All the equipments, accessories and wiring shall have tropical protection involving special treatment of metal and insulation against fungus, insects and corrosion.

3.6 Design Criteria

3.6.1 The Battery charger will constitute the DC power supply source for all stations loads.

3.6.2 The equipment will be installed indoor in a clean but hot, humid and tropical atmosphere.

3.6.3 The battery charger combination shall be such as to ensure continuity of DC supply at load terminals at all times without even momentary interruption.

3.6.4 Further, the voltage at load terminals shall never exceed the limits of 10% and -15% of nominal, system concept.

3.7 System Concept

3.7.1 The battery charger panels shall consists of the following:

- a) A Charger – 1& 2 panels each consisting of separate boost cum float with trickle charging feature, float charger Switching cubicle and DCDB suitable for charging of 220V, 645AH battery set besides meeting continuous and emergency DC loads as detailed elsewhere in the specification.
The above modes of charging both automatically and manually shall be through manually operated Auto / manual selection switch.
- b) The boost cum float charger shall be capable of initially charging of the 220V, 645AH battery at quick rate after an emergency or after a discharge test or for giving periodical curative charge once or twice a year as per battery manufacturer's recommendations.
- c) The float charger shall always be connected to the DC load and shall maintain a steady voltage of 220V, plus or minus 0.5 % using a constant potential controller.
- 3.7.2 During normal condition the float charger shall be on and working in parallel with DC load and battery. The rating of the float charger shall be such as to meet the float charge current requirement of the battery plus the continuous DC load, the details of which is given elsewhere in the specification. While boost charging the battery set shall be across boost-cum float charger and float charger shall be across the load.
- 3.7.3 During the boost charging, if there is an AC supply failure, the battery should automatically be connected to the load to maintain continuity of DC supply.
- 3.7.4 Further, to have battery supply across load even during short interval of change over period and if float charger develops trouble, the 84th cell of the battery should be capable of being connected through a blocker diode to the load so that under boost charging condition the float charger, the continuous DC load and battery up to 84th cell are in parallel. Charger – 2 panel shall be exactly same as charger-1 panel.

3.8 Rating

The ratings for boost-cum float charger, trickle charger, float charger and emergency lighting change over system shall be as detailed below:

Sl. No.	Particulars	Required value
a.	Boost charger	220V, 645AH
	i) Range of voltage	190 to 300V
	ii) Continuous current rating	100 Amps

b.	Trickle charger and float charger i) Range of voltage ii) Continuous current rating – float iii) Trickle charger current	198 to 280 V 85 Amps minimum 200mA Min – 800mA Max
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Note: **The above values are indicative only.** Bidder has to design and furnish the value based on the specific system requirement as mentioned elsewhere in the specification.

3.9 Detailed specification for charger panel

The battery charger shall be supplied complete with all devices including but not limited to the following. If any device/components felt is required at the time of approval of drawings, the same shall be provided without any extra cost.

3.9.1 Each charger panel shall consists of

- a) **A Boost cum float charger** operating on AC input voltage of 415 volts -15 % to +10%, three phase, 50hertz, $\pm 5\%$, to give a DC output ranging between 190V to 300V so as to quick charge a bank of 110cells each of 2V from an end voltage of 1.75V to 2.65 / 2.7 V at a Max, continuous rate of **100** A and shall consist of the following components (boost charge current – start – **100A**, finish **50** Amps).
 - i. One No. 3 pole MCCB required for ON / OFF of AC input of adequate rating.
 - ii. Required Nos. of HRC fuses with base, fittings etc. for Rectifier circuit.
 - iii. Three Nos. of pilot lamps for indicating availability of 3 phase supply.
 - iv. One constant potential controller for error detection, load current detection, amplification etc., so that the Boost charger output voltage is maintained automatically to the required value, with input voltage variation detailed above.
 - v. One 3Ph naturally air cooled transformer liberally rated for the rectifier rating. The rectifier transformer shall be of class F type insulation. The rating of the rectifier transformer shall have 10% overload capacity. The material of the winding shall be Copper.
 - vi.
 - ✎ One set of 3- phase full wave bridge connected silicon rectifier, with zener type thyristor with simple

smoothing circuits, liberally rated to meet the continuous current rating specified with stepless voltage control.

- ✘ One set ripple filtering device (chokes & capacitors) to limit the ripple content to less than 1%

- vii. One change over device to automatically change the charger – operating mode from boost charger to float charge for a predetermined voltage condition. In the event of AC power supply failure or when the battery is being boost charged, available battery capacity shall be automatically transferred to the DC bus. In case of failure of any electronic component of the Auto controller of the charger, there must be always an alternate provision to operate the charger in Manual mode.
- viii. One double pole moulded case circuit breaker on DC output side.
- ix. A set of indicating lamps for DC on indication & A.C supply indication
- x. One Digital DC ammeter with shunt etc., for measuring DC output.
- xi. One Digital DC voltmeter to read boost charge voltage, and one AC volt meter for AC input voltage with in built selector switch.

Note: The make of Digital meters shall be of AE, Rishab, conserve, Elmeasure EAPL, Siemens, L&T, secure

- b) A float charger operating on AC input voltage of 415 V –15% to + 10%, three phase 50Hz + 5% to give a DC output ranging from 200V to 280V separately controlled to give a continuous variable load max 85 A and to give a trickle charge current of 200 to 800 mA the load current varying from 0-100% and consisting of the following components.
 - i. One No. 3 Pole MCCB for ON/OFF of AC input of adequate rating.
 - ii. Required Nos. of HRC fuses with base fittings, etc. for Rectifier circuit.
 - iii. Three Nos. of pilot lamps for availability of 3-Phase supply.
 - iv. One No. AC input contactor with over –load releases and coil /ON /OFF switch.
 - v. One constant potential controller for error detection, load current detection, amplification etc., so that the float

charger output is adjusted automatically such that the battery voltage is around 220 volts with load current and input voltage variation detailed above (both) occurring simultaneously.

- vi. One auto manual change over switch.
- vii. One main transformer, 3 phase, dry air (AN) cooled, continuously rated liberally rated for the rectifier rating specified. The transformer shall be of class F insulation. The rating of the rectifier transformer shall have 10% overload capacity. The material of the winding shall be Copper.
- viii.
 - ✎ One set of 3 phase full wave bridge connected silicon rectifier with zener type thyristor with simple smoothening circuit liberally rated to meet the continuous current rating specified with step less voltage control.
 - ✎ One set ripple filtering device (Chokes & capacitors) to limit the ripple content to less than 1%.
- ix. One moulded case circuit breaker to control float charger DC output.
- x. Required Nos. of HRC fuses with base fittings etc for Rectifier circuit.
- xi. One Digital DC Ammeter with shunt for measuring float charger current.
- xii. One Digital DC voltmeter to read float charger voltage and AC voltmeter with inbuilt selector switch for AC input voltage.

Note: The make of Digital meters shall be of AE, Rishab, conserve, Elmeasure EAPL, Siemens, L&T, secure

- c) Each DC distribution board (Compartmentalized type) consists of
 - i. Electrolytic Copper insulated DC bus bars of adequate rating.
 - ii. One Double pole DC MCB of 32A rating shall be provided for each of the Lines, Transformers, Bus reactors, Station Auxiliary system etc., including future bays. Minimum 40 Nos. of DP DC MCB of rating 32A shall be provided for outgoing feeders. Each compartment shall accommodate maximum of 4 Nos. of MCB

- iii. DC fail indication along with Hooter (AC hooter) shall be provided.
- iv. 01 No. Double pole moulded case Circuit Breaker (MCCB) of 250A rating on DC input side.
- v. 01 No. Digital voltmeter.
- vi. 01 No. Digital Ammeter of (0-100)A range.
- vii. 01 No. Bus-coupler Double pole, moulded case circuit breaker (MCCB) of 250A rating shall be provided in DCDB-1

Standard scheme of interconnection of switchboard and distribution boards along with tentative feeder disposition for each board is indicated in Standard SLD of DC system enclosed. The bidder shall quote board prices on the basis of standard SLD and their estimation of feeders for entire present and future bay requirements (minimum of 50 Nos. of feeders shall be considered). Any other feeder required as per system requirement for efficient and reliable operation shall be deemed to be included in bidder's scope.

The construction of DCDB shall be compartmentalized type. The arrangement shall be such that Main horizontal bus-bar compartment shall be provided on the top. Auxiliary vertical bus-bar shall be provided in a separate compartment vertically and separate compartment for outgoing feeders (MCB's in the front side, TBs on the rear side of the panel) shall be provided vertically. The typical general arrangement drawing of DCDB is enclosed.

d) Important Note

- i. For each station two charger panels each consisting of one boost cum float charger and one float charger & one DCDB detailed above shall be supplied.
- ii.
 - ✎ Fuses for DC output and AC input shall be brought on the front of the panel and cut-outs provided.
 - ✎ Semi conductors devices, Power failure, relay alarms on Ac failure to be provided and shall disconnect all internal charger loads from battery to prevent unnecessary discharging during power failure.
- iii. Printed circuit shall be accommodated in modules, plug in type, and similar modules shall be interchangeable in standard socket chasis.

- iv. Following potential free contacts shall be provided & terminated to TB for Sub-station Automation System (SAS) compatibility for each charger-1/ 2 Panel:

	Float charger	Boost Charger	Switching cubicle
i.	Float AC Mains fail	Boost AC Mains fail	Load bus under voltage
ii.	Float DC over voltage	Boost DC over voltage	Blocking diode fail
iii.	Float DC under voltage	Boost DC under voltage	Battery/DC Earth fault
iv.	Float DC over load	Boost DC over load	Battery on Boost
v	Float Rectifier fuse fail	Boost Rectifier fuse fail	Battery on Float
v.	Float capacitor fuse fail	Boost capacitor fuse fail	Battery under voltage
vii.	Float charger DC fail	Boost charger DC fail	Battery over voltage
viii	Float charger ON	Boost charger ON	

- v. Following transducers shall be provided and terminated to terminal bays for Sub-station Automation System (SAS) compatibility for each charger 1 & 2.

Float charger	Boost Charger	Switching cubicle
Float charger output current	Boost charger output current	Battery current
Float charger output voltage	Boost charger output voltage	Battery voltage
		Load current
		Load voltage

3.9.2 Following equipments for each switching cubicle of Charger-1 & Charger-2 are required.

- One set of single pole two way no-off, suitably rated change over switch for selection of Battery charging in Float/ Boost mode.
- 01 No. MCCB triple pole for connection of 110th cell and 84th cell positive and for first cell negative.
- 01 DC Contactors for connecting the battery 110th cell to bus positive through above MCCB.
- 01 silicon blocker diodes for connecting 84th cell positive to positive of DC bus through the above MCCB.

- e) One Double pole MCCB of rating equipment to Battery MCCB shall be provided for curative discharge of battery.
- f) One set of automatic emergency light circuits of 32A rating with DC contactors, etc.
- g) Suitable no. of earth leakage circuits for annunciation both audible and visual with push button for reset.
- h) 01 No. Digital DC Ammeter with shunt (0-100)A range for Load current, 01 No. centre zero DC Ammeter with shunt (100-0-100)A for charge/discharge current and 01 No. centre zero DC Ammeter (10-0-10)A for measuring trickle charging current.
- i) 01 No. Digital of DC voltmeter of range (0-350)V with selector switch to measuring Float-voltage, Boost-voltage, Load voltage, Battery 110th cell voltage & Battery 84th cell voltage.

Note: The make of Digital meters shall be of AE, Rishab, conserve, Elmeasure EAPL, Siemens, L&T, secure

- j) A set of audible and visual alarm annunciation scheme with all necessary accessories to acknowledge and test scheme as also other necessary relays, with the following face window.

	Float charger	Boost Charger	Switching cubicle
i.	AC Mains fail	AC Mains fail	Blocking diode fail
ii.	Float Charger DC Fail	Boost Charger DC Fail	DC Earth fault
iii.	Rectifier fuse fail	Rectifier fuse fail	Load Bus DC fail
iv	Filter fuse fail	Filter fuse fail	Battery under voltage
v.	Float charger over load	Boost charger over load	Battery over voltage
vi.	Float DC over voltage	Boost DC over voltage	
vii	Float DC under voltage	Boost DC under voltage	

NOTE

- (i) All MCCB shall be of breaking capacity of 25 KA with over load and short circuit protection.

3.9.3 All battery chargers shall have a constant voltage characteristic throughout the range (from 0 to full load) at the floating value of the voltage so as to keep the battery fully charged but without harmful overcharge.

- 3.9.4 All chargers shall have load limiters having drooping characteristic, 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 characteristics 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.
- 3.9.5 Uniform and step less adjustments of voltage setting through potentiometer shall be provided on the front of the charger panel covering the entire float charging output range specified.
- 3.9.6 Step less adjustments of the load limiter setting shall also be possible from 80% to 100% of the rated output current for charging mode.
- 3.9.7 The charger manufacturer may 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 Float charging mode is used as current setting device in boost charging mode.
- 3.9.8 The necessary internal wiring, space heater, terminal blocks, panel to mount the equipments shall be provided.
- 3.9.9 The equipments not specifically covered in the above schedules but required for the satisfactory working of schematic arrangements detailed elsewhere in the specification shall be provided by the supplier, giving all the details.
- 3.9.10 The makes of all equipments supplied shall be detailed. The equipments shall be carefully selected such that only proven components are used particularly the diodes, thyristors etc., so as to give trouble free operation.

3.9.11 Interference Against Re-Circuits

The equipment shall be efficiently screened against interference to radio as also other communications equipment, which may be installed in the same building. All the sources of noise shall be fitted with Re-suppressors generally in accordance with relevant IS/IEC.

3.10 Charger Construction

- 3.10.1 The panels shall have maximum height of 2.5 m. It shall consist of completely enclosed self supporting cubicle type CRCA sheet steel enclosures for mounting various equipments. The charger shall be fabricated from 2.0 mm cold rolled sheet steel and shall have

folded type of construction. Removable gland plates for all cables shall be supplied by the contractor. Each panel assembly shall have easily removable hinged door at the front and the back with easy access for inspection and maintenance. The sheet steel shall be of minimum 3mm thickness where equipments are mounted on them and the side and back door sheets shall be mounted on structural steel of light but rigid sections. The bottom of the panel and frame works shall be suitable for mounting on slush concrete floor using evenly spaced ground bolts projecting through the base channel. All doors and covers shall be fitted with synthetic rubber gaskets. All the cubicle doors shall be properly earthed. The degree of protection of charger enclosure shall be at least IP 4X as per IS 13947-Part 1.

All indicating instruments, control switches and indicating lamps shall be mounted on the front side of the charger.

The equipment layout on the panel be such as to give neat appearance ease of operation of various equipments keeping the overall width to the barest minimum.

- 3.10.2 The rear, side and front enclosing, steel sheet shall be such as to have good ventilation particularly for the portion housing transformers etc.

COOLING

Natural air cooling shall be employed in all units. Suitable louvers with fine mesh or perforations are to be provided in the panels for this purpose. The use of fans etc., for including accelerated air flow is precluded. Oil cooled components are not acceptable.

4.1 PAINTING

All sheet steel work shall be pre-treated, in tanks, in accordance with IS:6005. Degreasing shall be done by alkaline cleaning. Rust and scale shall be removed by pickling with acid. After pickling, the parts shall be washed in running water. Then these shall be rinsed in slightly alkaline hot water and dried. The Phosphate coating shall be 'class -C' as specified in IS-6005. Welding shall not be done after phosphating. The phosphating surfaces shall be rinsed and passivated prior to application of staved lead oxide primer coating. After primer application, two coats of finishing synthetic enamel paint of shade - RAL 7032-Siemens Grey shall be applied, unless required otherwise by the owner. The inside of the chargers shall be glossy white. Each coat of finishing synthetic enamel paint shall be properly staved. The paint thickness shall not be less than fifty (50) microns.

4.2 BUSES, SWITCHING DEVICES AND CONNECTIONS

All buses, switching devices and connections shall be of sufficient size to limit the temperature rise to 45° C (Peak) inside the enclosure while carrying full load current. All main bus joints and bus to taps shall be silver plated and tightly clamped with through bolts to ensure maximum conductivity. All buses wherever possible shall be of rigid type. They shall be liberally spaced and so mounted that their expansion and contraction do not subject either the bars or the insulating supports to any stresses. Wherever required, suitable expansion joints shall be provided. All bus work and connections shall be accessible for inspection and maintenance purpose from end to end, after first removing respective enclosing plates. All buses, AC & DC switches connections shall be designed to carry 25 KA for 1 second.

4.3 Ground Bus

For ensuring the rigid connection the minimum section of the ground bus shall not be less than 160 Sq. mm. The ground bus shall be earthed solidly and connected to the purchaser's station main earthing system through 50 x 6 mm G.I flat with 2 bolts of M12 size.

4.4 SPACE HEATERS AND LIGHTING OUTLETS

Space heaters shall be provided inside all cubicles and panels to prevent condensation of moisture. Wiring connection to the space heaters in the cubicles shall have suitable insulation over a safe length from the heater terminals. All lighting outlets with the switches etc., shall be provided inside each entrance door at the back of the panels.

4.5 WIRING

The internal power and control wiring of the charger shall be of adequate rating as recommended by cable manufacturers and relevant IS.

The interconnecting cables or bus bars carrying load current from the main transformers secondary onwards upto and including DC output bus bars shall be copper. Interconnecting leads in the control circuits and leads of filter capacitors shall also be of copper. Ends of all load current carrying cables shall be fitted with copper lugs of adequate rating and shall be soldered or crimped effectively to the conductor to ensure that the temperatures rise at the joints does not exceed that of the conductors. All cabling and wiring shall be neatly secured in position and adequately

supported. All cables and wire carrying AC supply shall be kept separate from other cables. The colour scheme employed for the cabling and wiring shall be shown in the suppliers instructions manual. The colour scheme employed shall be as follows :

- i. For AC Circuits - Respective phase : Red, Yellow, Blue
Neutral: Black
- ii. For DC Circuit - +ve - Red
-ve - Black
“Earth” - Green

All outgoing wiring shall be brought out to terminals on terminal blocks provided with 10% additional terminals. The terminal end shall be provided with suitable identification marks. All the terminals shall be of nut and stud type of brass coated with nickel, not less than 8mm and suitably rated to carrying the respective rated current.

- 4.6 The insulation of all circuits, except the low voltage electronic circuits shall withstand test voltage of 2kV AC for one minute. An air clearance of atleast ten (10)mm shall be maintained throughout for such circuits, right upto the terminal lugs. Whenever, this clearance is not available, the live parts shall be insulated and shrouded.

4.7 SPACE FOR CABLE AND CABLE GLANDS

Sufficient space for receiving the cables inside the switch board on the bottom, cable glands and mounting arrangements for the feeders shall be suitable for PVC insulated cables. The size of the cables shall be intimated at later date. Necessary cable glands for all cables shall be included in the supply.

4.8 **MIMIC DIAGRAM:**

The mimic diagram shall be incorporated with red and green lamps for indicating air circuit breakers position. Switchboard purpose, built in LED type lamps inter changeable and suitable for easy replacement shall be provided.

4.9 **NAME AND IDENTIFY PLATES**

Twelve mm (half inch) wide plastic plates bearing suitable identification marks shall be fixed on the exterior of the switch board in appropriate places to indicate the function of different switches, electrical devices, measuring instruments etc., and

circuit breakers. Also suitable designation plates with details shall be provided for all equipments inside the panel.

4.8 EARTHING

Earthing of a dead metallic part of bodies of the equipment on the panels shall be done with a soft drawn single conductor bare copper. Main connection shall have minimum area of 14.5 mm and the main earthing connection to the earthing bus bar, 65 sq. mm. These wires shall be connected to suitable terminals and clamp junctions. Soldered connections shall not be employed. The no. of earthing terminals shall be two for the whole assembly of panels.

5.0 INDICATING INSTRUMENTS

All instruments shall be of the square switch board type, of 96 Sqmm. Size back connected, suitable for semi flush mounting and provided with dust light cases for tropical use with dull black enamel finish. The accuracy class shall be 1.5. The dials shall be made of such materials as to ensure freedom from wrapping, fading and discolouring. Marking on scales shall be black on white background. All instruments shall have practicable laboratory means of adjustments to accuracy. The limits of error shall be those permissible for switchboard instruments as per IS-1248 or BSS-87. The instruments shall be capable of indicating correctly when operated continuously at any temperature from 0°C to 50° C. Instruments shall be able to give correct indication at a temperature of 65° C a for period of 16 hours. Necessary test blocks shall be provided.

5.1 MCCB

FC & FCBC chargers shall have 2 MCCB on the input side to receive cables from the I/C AC source. Further, FC & FCBC shall be fed from two different sources. MCCBs should have auxiliary contacts for annunciation.

5.2 RECTIFIER ASSEMBLY

The Silicon rectifier assembly shall be fully controlled bridge type and shall be designed to meet the duty as required by the respective charger. The rectifier shall be provided with heat sink having their own heat dissipation arrangements with natural air cooling. Necessary surge protection devices and rectifier type fast acting HRC fuses shall be provided in each arm of the rectifier connections. .

5.3 REGULATION

The DC output shall be maintained at + 1% for input AC Voltage variation of + 10% from no load to full load and input frequency variation from 47.5 Hz to 52.5 Hz. The power factor shall not be less than 0.65.

5.4 **Type Tests:**

Type test certificates as per relevant standards shall be furnished by the tenderer.

Type tested Battery Charger shall be offered. The type test reports shall not be older than ten (10) years as on the last date of submission of bid.

a) For Battery Charger manufactured in India:

- i. Type tests on indigenous equipment for which testing facility is available in India, should have been conducted in any independent laboratories approved by Government or accredited by National accreditation body of the country like Central Power Research Institute (CPRI), Electrical Research and Development Association (ERDA), etc.
- ii. Type tests on indigenous equipment, for which testing facility is not available in India, should have been conducted in a laboratory of foreign country accredited by National accreditation body of that country.
- iii. The type tests conducted in-house by manufacturers shall also be acceptable provided the lab (manufacturer's) is accredited by National accreditation body of the country and the tests have been witnessed by a representative of NABL accredited Independent laboratory/Power utility.

b) For Battery Charger manufactured Abroad:

- i. Type tests on imported equipment should have been conducted in an Indian Laboratory or foreign laboratory accredited by National accreditation body of respective country.
- ii. Type tests conducted in-house by manufacturers shall also be acceptable provided the laboratory is accredited by National accreditation body of the country and the tests have been witnessed by a representative of accreditation body/Power utility.

a) Type tests of battery charger :

- i. Electromagnetic compatibility (EMC) Tests as per

- IEC 61000-6-2, Generic standards – Immunity for Industrial environments – All Tests
- IEC 61000-6-4, Generic standards – Emission standard for Industrial environment – All Tests
- IEC 61000-4-10, Testing and measurement Techniques- Damped oscillatory magnetic field immunity test
- IEC 61000-4-18, Testing and measurement Techniques – Damped oscillatory wave immunity test

ii. Voltage regulation test

iii. Load limiter characteristic test

iv. Efficiency Tests

v. High voltage test

vi. Temperature rise test

vii. Short circuit test at no load at rated voltage for sustained short circuit.

viii. Degree of protection test

ix. Measurement of ripple by Oscilloscope

5.5 Routine tests on Battery charger :

- i. Insulation resistance test
- ii. Voltage regulation check from 0 to 100% load with $\pm 10\%$ voltage variation.
- iii. Ripple content measurement
- iv. Heat run test on current limiting value

5.6 Test Witness

Test shall be performed in the presence of Purchaser's representatives.

5.7 Test Certificates

Certified reports of all the tests carried out at the work shall be furnished in 3 copies for approval of the purchaser. The equipment shall be dispatched from works only after the receipt of Purchaser's written approval of test reports.

5.8 SPECIAL TOOLS & TACKLES

A set of special tools and tackles which are necessary or convenient for erection, commissioning, maintenance and overhauling of equipment shall be supplied.

5.9 SPARES

The Tenderer shall submit a list of recommended spare parts for three years & satisfactory and trouble free operation indicating the itemized price item of spares.

5.10 TENDER DRAWINGS

Duplicate copies of the relevant drawings shall be submitted along with the tender.

5.11 CONTRACT DRAWINGS

The supplier shall submit four copies of the following drawings for approval.

- a) Details of construction of cubicles and complete drawings of the switch board indicating full details of the location switches, instruments, relays, bus bars, cable glands, support etc.
- b) Wiring and cabling diagram for all the circuits. All devices shall be numbered according to the international convention.
- c) Details of construction of boost and float charger.

5.12 SUPPLIER SHALL FORWARD

After the drawings are approved six copies of the drawing printed on 90 GSM paper shall be supplied for immediate use. The supplier should forward the drawings and literature as follows:

- a) One set of reproducible originals and 12 sets of blue print copies of all approved drawings along with 12 sets of literature, commissioning and maintenance manuals to the office of the Chief Engineer, Electy., Tendering and Procurement, KPTCL, Kaveri Bhavan, Bangalore – 560 009.
- b) Four sets of Xerox copies of all approved drawings along with four sets of literature and manual to consignees in respect of each of the stations.
- c) Non-supply or part supply of drawings, literature and manuals will be deemed as incomplete supply of switchboard.
- d) Foundation drawings indicating the details of foundation bolts cable entries and trenches etc.
- e) Elementary diagrams of all controls, metering, protection, annunciation and other circuits, panel wise. All devices shall be according to SA CODE.

- f) Schematic diagram's of PCB's and charger.
- g) Dimensional outline of charger drilling diagram and special mounting arrangement if any of each type of various devices.

5.13 INSPECTION

All the tests and inspection shall be made at the place of manufacture unless otherwise specifically agreed upon by the manufacturer and the purchaser at the time of purchase.

5.14 PACKING

The supplier shall provide such packing of goods as is required to prevent damage or deterioration during transport to their final destination. The packing shall be sufficient to withstand, without limitation, rough handling during transport and exposure to extreme temperature and open storage. The packing case, size, rates shall be taken into consideration, where appropriate, the remoteness of goods final destination and the absence of mechanized heavy handling facilities, at all points in transport.

5.15 DEVIATION FROM TECHNICAL SPECIFICATION

The tenderer shall furnish the details of deviation/modification proposed by him to improve overall performance of the system. The deviation shall be brought in the tender clause by clause as per annexure.

5.16 PERFORMANCE GUARANTEE:

The equipments offered shall be guaranteed for satisfactory performance for a period of 24 months from the date of satisfactory commissioning of equipment. The equipment found defective/failed within the above guarantee period shall be replaced or repaired by the supplier free of cost within one month from receipt of intimation. If the defective/failed components of battery chargers are not replaced/repared as per the above guarantee clause, the KPTCL shall recover an equivalent amount plus 15% supervision charges from any of the supplier's bills.

5.17 MINIMUM EXPERIENCE FOR QUALIFYING AS TENDERER :

- 5.17.1 The tenderer shall have a minimum experience of five years in the design, manufacture, testing and commissioning of Battery charger similar to the type specified in the present enquiry. At least 50% of the quantity of similar type of battery charger called for in the present enquiry shall be in successful operation for a minimum period of two years. The tenderer shall also furnish the details of

similar battery charger supplied by them so far giving order reference, name and address of the customer etc., also indicating the date of commissioning. The tenderer shall also furnish performance certificates for a period of minimum two years of similar battery charger in proof of the satisfactory operation of battery chargers.

- 5.17.2 Test reports for the test conducted in accordance with relevant ISS or BS or equivalent standards shall be supplied. Three copies of test certificates shall be furnished along with the tender without which offer is liable to be over looked. Further the test certificates furnished shall pertain to test carried out not older than five year from the date of notification of bid.

ANNEXURE - I

SCHEDULE OF GUARANTEED TECHNICAL PARTICULARS OF 220V, 645AH BATTERY CHARGERS

Sl. No.	Particulars
1.	Manufacturer's type of designation :
2.	Type of Rectifier and rating as per : IS – 3895 – 1966 with latest version.
3.	Rectifier Assembly:
	a) Type of semiconductor. :
	b) Rated direct current per cell. :
	c) Rated direct voltage. :
	d) Rated input voltage :
	e) Type of connections of rectifier. :
	f) Standard applicable. :
4.	Input AC supply.
	a) Voltage :
	b) Current :
	c) No. of Phases :
	d) Frequency :
	e) Power Factor :
5.	Transformer: For Boostcum Float Charger For Float Charger
	a) Voltage ratio of Transformer & KVA rating & Percentage impedance.
	b) Type
	c) Primary
	d) Secondary
	e) One minimum power frequency withstand voltage
	f) Material of primary & secondary winding

6. Boost/Quick charge current
 - Minimum :
 - Voltage setting range :
 - Maximum :
7. Float Charge Current
 - Minimum :
 - Maximum :
8. Trickle Charge Current
 - Minimum :
 - Maximum :
9. Whether Auto/Manual feature is provided. :
10. Whether voltage across load is constant while boost/quick charging the battery. :
11. Whether change over device to automatically change the charger – operating mode from boost charger to float charge for a predetermined voltage condition is provided:
12. a) Allowable limits to voltage variation on A.C. side for satisfactory charging of DC side. :
- b) Type of device on AC side :
13. Instantaneous forward voltage drop versus instantaneous current at rated service (a graph to be enclosed) :
14. Type of voltage control for Boost cum float Charger, Float charger & Trickle Charger :
15. Automatic voltage regulator (Float mode)
 - a). Type :
 - b). Percentage stabilization of output DC voltage :
 - c). Voltage setting range :

16. Manual voltage regulator
 - a). Type
 - b). Voltage setting range
17. Instantaneous reverse current
versus instantaneous reverse volts :
at rated service (a graph to be enclosed)
18. Range of variation of DC voltage :
and device used for the same.
19. Rated DC output for
 - a) Boost cum float Charger :
 - b) Float Charger :
20. D.C. output voltage regulation from
no load to full load. :
21. Maximum ripple content in % :
22. Maximum permissible temperature
rise over an ambient temperature :
23. Whether the charger is tropicalised :
24. Over load capacity. :
25. Duration of overload. :
26. Efficiency at
 - a) 25% Load. :
 - b) 50% Load :
 - c) 75% Load :
 - d) 100% Load :
27. Dimensions of the charger width x
Height x depth in mm :
28. Weight of the charger in Kgs. :
29. Recommended spares :
30. List of major accessories provided :
31. Other Details, if any :
32. Rating & make of Thyristor :

33. Meters:
- a). Type
 - b). DC Voltmeter range
 - c). DC Ammeter range
 - d). Dial size
 - e). Accuracy class as per IS
34. Contactor:
- a). Type
 - b). Rated voltage
 - c). Rated current
 - d). No. of power contacts
 - e). No. of type & rating of auxiliary contacts
 - f). Operating coil voltage
 - g). Dropout voltage
35. Thermal overload relay
- a). Tripping current range
 - b). whether single phasing protection provided
 - c). Standard applicable
36. Heat Sink for Boost Charger & Float Charger
- Whether provided :

DETAILS OF COMPONENTS & RATING

I **BUS BARS**

- i. Sectional Area :
- ii. Material :
- iii. Current Carrying Capacity :
- iv. Maximum Temperature rise over 45°C
ambient with continuous full load
condition :
- v. Type of Supporting Insulator :

II **Small Wiring**

- i. Type :
- ii. Size :

III Moulded Case (OR Equivalent)

Air Break Switch & Fuse Units

- i. Type :
- ii. Make :
- iii. Normal Voltage :
- iv. Normal Current :
- v. Interrupting Capacity :
- vi. Fusing Factor for fuses :
- vii. Temperature rise of contact under °C
continuous full load condition over 45°
ambient temperature :
- viii. Material & Type of Contact :

IV Dimensions of Battery Charger-1/2 Panel :

- i. Width :
- ii. Depth :
- iii. Height :

V i. Number of Crates for Shipment, Shipping Dimensions of the largest crate :

- ii. Whether equipments and the switchboards
are tropicalized or not :

- iii. How is access provided to the switchboard interior :
- iv. Mounting Arrangements for cable glands provided. :

Date :.....

Signature

:.....

Place :.....

Designation:.....

Company:.....

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Annexure – II

Schedule of Tenderer's Experience

1. Name of the Manufacturer :
 2. Standing of the Firm as manufacturer of Equipment :
 3. Testing Facility at manufacturer's work. :
 4. If the Manufacturer is having collaboration With another Firm, details regarding standing of parent Firm, Period of collaboration :
 5. Description of equipment similar to that quoted, supplied and installed during the last 5 years with names of parties to whom the supplies are made along with PO No., the names of persons to whom a reference may be made by purchaser in case the considers such a reference necessary
- Shall be furnished in the Form indicated below

Sl. No.	Description	Value of Work	Place Where installed	Period of Execution & date	Client	Persons to whom reference can be made
(a)	(b)	(c)	(d)	(e)	(g)	(h)

Date :.....

Signature :.....

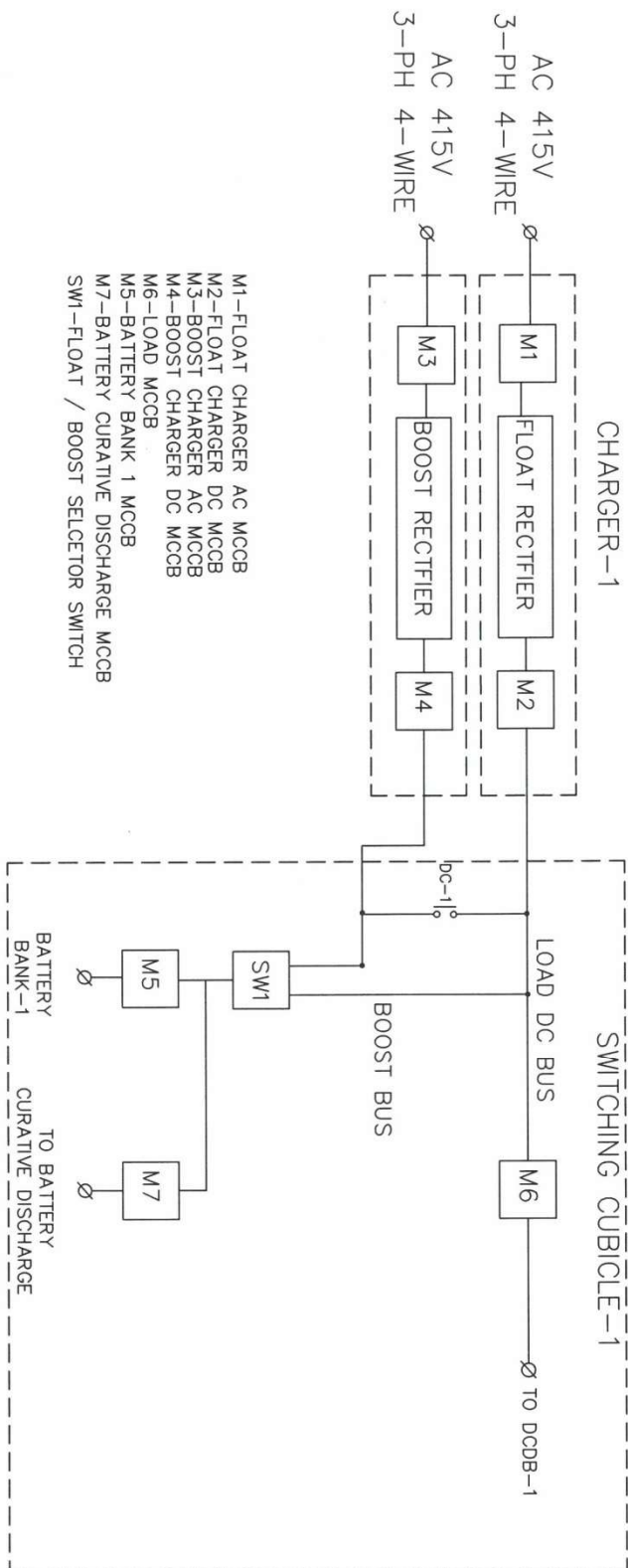
Place :.....

Designation:.....

Company:.....

BLOCK DIAGRAM FOR CHARGER -1
BATTERY CHARGER 220V-645AH
FC 87A + FCBC 100A + SW

FC-1+FCBC-1+SW-1



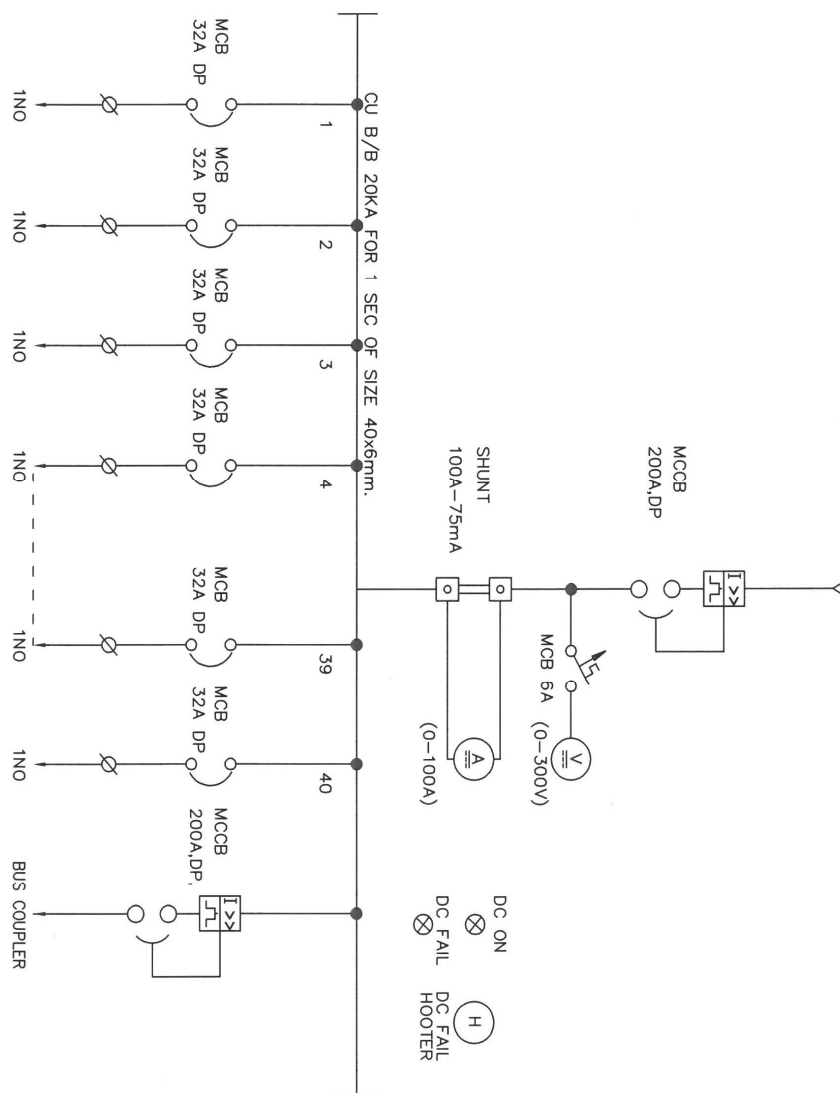
KARNATAKA POWER TRANSMISSION CORPORATION LIMITED
DRG.NO.KPTCL/TECH/BLOCK **DI**AGRAM CHARGER-1

FC-2+FCBC-2+SW-2



DIAGRAM CHARGER-2

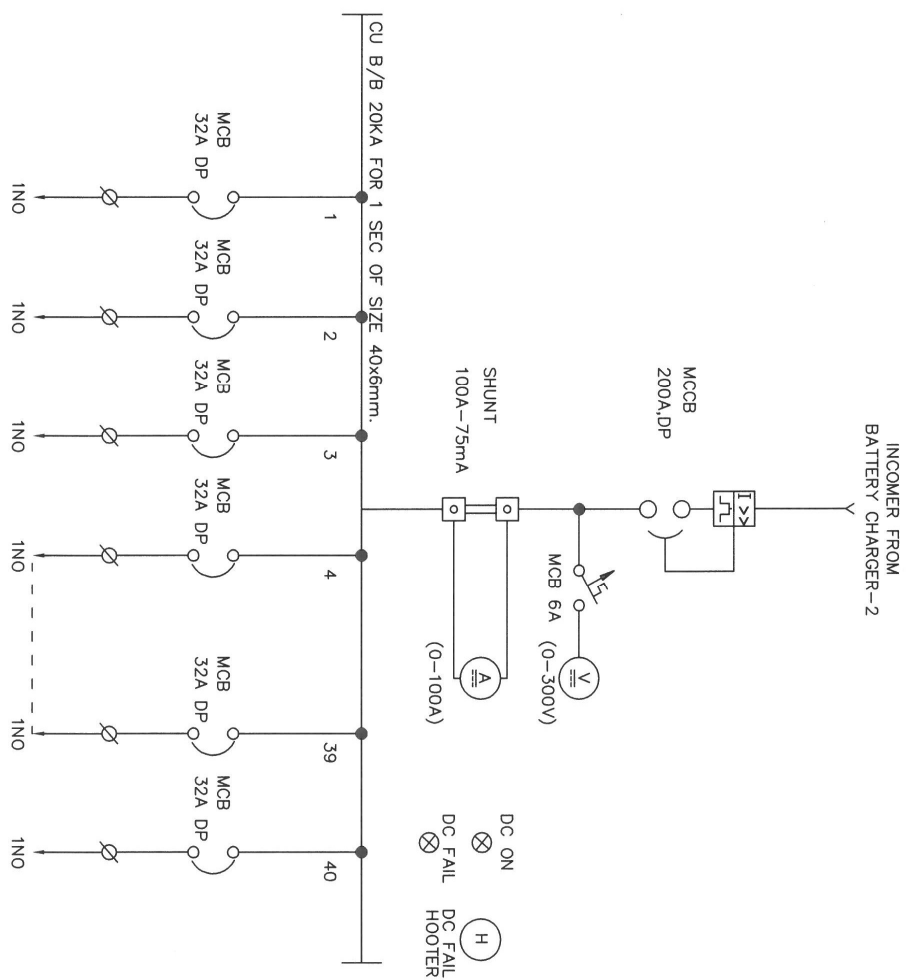
INCOMER FROM
BATTERY CHARGER-1



KARNATAKA POWER TRANSMISSION CORPORATION LIMITED

DRG.NO.KPTCL/TECH/220V DCDB-1 SLD

SINGLE LINE DIAGRAM FOR 220V DC DISTRIBUTION BOARD-2



KARNATAKA POWER TRANSMISSION CORPORATION LIMITED
DRG.NO.KPTCL/TECH/220V DCDB-2 SLD

Typical GA of DCDB

