REASON DOCUMENT FOR THE FINAL DRAFT SPECIFICATION NO TI/SPC/PSI/40-150CHGR/1210 of BATTERY CHARGER FOR 110 VOLT, 40 AH LEAD ACID BATTERIES for 25 KV SSP/SP and 150Ah LEAD ACID BATTERIES 2X25KV SSP/SP

Clause No.	Description	Comments Received from	RDSO's remark
1.1	The specification applies to the design, manufacture, supply and erection & commissioning of battery chargers for charging 110 V, 150 Ah lead acid batteries installed at unattended 2X25 kV traction switching stations (SSP/SP/AT) and 40 Ah lead acid batteries installed at unattended 25 kV traction switching stations (SSP/SP).	**M/s CONCORD, Lucknow** Ratings are different. Hence for economical product, it would be better to have 2 different charger.	This specification is meant for two separate battery charger for 40 Ah & 150 Ah batteries. For more clarity a sentence "**Separate battery charger shall be developed for 40Ah & 150Ah lead acid batteries**" is added.
2.2	The battery chargers are required for installation in control cubicles of unattended 25 kV switching stations to keep the batteries on float charge under normal conditions. The charger shall also be suitable for effecting quick charge of a discharged battery when set to the boost charge position. The steady super-imposed load on the charger will be about 100 mA. The masonry control cubicles are situated close to the Railway tracks and hence the Panels are subjected to vibrations due to running trains.	**M/s CONCORD, Lucknow** The charger shall also be suitable for effecting quick charge of a discharged batter	The existing para may be corrected as "**The battery chargers are required for installation in control rooms of unattended 25 & 2x25 kV switching station (SSP/SP). The charger shall also be suitable for effecting quick charge of a discharged battery. The steady super-imposed load on the battery charger will be maximum 2 Amp 40Ah battery charger and 4 Amp for 150 Ah battery. Steady superimposed load will vary depend on type of SSP/SP and number of lines. The control room cubicles are situated close to the Railway tracks and hence the Panels are subjected to vibrations due to running trains."** **Reason:** The steady super imposed load increased from 1oo mA to 2 A max. for 25KV SSP/SP considering magnetic type switchgear. The steady super imposed load current for 150Ah battery charger is also added.
4.1 (vi)	Charging characteristics: a) Trickle charge	**Battery charger for 40 Ah battery** Adjustable between 50 mA & 2000mA in suitable steps at any voltage in the range 115 V to 135 V.	**M/s CONCORD, Lucknow** **Battery charger for 40 Ah battery** Adjustable between 50 mA & 2000mA in the range 115 V to 135 V. **Battery charger for 150 Ah battery** Adjustable between 50 mA & 5000mA in the range 115 V to 135 V.	1. In regard to M/s CONCORD comment, this specification is meant for two separate battery charger for 40 Ah & 150 Ah batteries. For more clarity a sentence "Separate battery charger shall be developed for 40Ah & 150Ah lead acid batteries" is added in para 1.1 of the specification.

		Battery charger for 150 Ah battery Adjustable between 50 mA & 5000mA in suitable steps at any voltage in the range 115 V to 135 V.	Two separate Battery Chargers for different Batteries capacity **M/S Electrostar, Kolkata** Trickle charge : Battery charger for 40Ah & 150AH. Normally the output of the charger shall be 2.15V/ cell adjustable from 2.12 to 2.3V per cell by a pre set potentiometer provided on the PCB for smooth step less control of trickle voltage. In this mode the charger will operate in constant potential mode. Note : Standard charging method for Lead Acid Battery as prescribed by battery manufacturers. **M/S Universal, Mumbai** Trickle charge: The Battery Charger is in constant voltage mode. As per Battery manufacturer's recommendation the output of the charger shall be adjustable from 2.1 to 2.15V per cell by a potentiometer for smooth step less control of trickle voltage.	2. The comment of M/s Electrostar and M/s Universal are in same line except adjustable range of voltage. The wider range of adjustable voltage may be accepted and existing para modified as " **Battery charger for 40AH battery, the output voltage of the charger shall be adjustable between 115 to 127 V (2.1 to 2.3 V per Cell) by a potentiometer provided on the PCB for smooth step less control of trickle voltage. In this mode the charger will operate in constant potential mode with current limit."** **Battery charger for 150Ah the output voltage of the charger shall be adjustable between 115 to 127 V (2.1 to 2.3 V per Cell) by a potentiometer provided on the PCB for smooth step less control of trickle voltage. In this mode the charger will operate in constant potential mode with current limit. In this mode the charger will operate in constant potential mode with current limit."**
	(b) Boost charge	**Battery charger for 40 Ah battery** Adjustable between 0.5 A and 5A in suitable steps at any voltage in the range 100 V to 150V **Battery charger for 150 Ah battery** Adjustable between 0.5 A and 20A in suitable steps at any voltage in the range	**M/s CONCORD, Lucknow** **Battery charger for 40 Ah battery** Adjustable between 0.5 A and 5A in the range 100 V to 150V **Battery charger for 150 Ah battery** Adjustable between 0.5 A and 20A in the range 100 V to 150 V. Boost charging should be Dual rate and output should adjust in 2 stages as per standard battery specifications. Output 5A for the first phase and 2.5A for second phase. This is to ensure long life of the battery and prevent over charging. 150AH Battery Charger can be clubbed with 200 and 250AH Battery Charger.	The comment ofM/S Universal, M/s CONCORD and M/s Electrostar for dual rate output may be accepted and existing para may be revised as " **Battery charger for 40Ah** **Two rate of charging current shall be adjustable between 0.5 to 5 A through the potentiometers provided on PCB. Starting rate of charging shall be run up to 130V (2.35 V/cell) and then with reduced current, finishing rate of charging shall be up to 151V (2.75V/cell). After that the charger shall be back in trickle mode. In trickle**

		100 V to 150 V	**M/S Electrostar, Kolkata** Boost charge: Battery charger for 40Ah & 150Ah. Battery Two rate of charging current can be adjusted through the pre set potentiometers which are provided on PCB. Starting rate of charging runs up to 2.35 V/cell and then with reduced current, finishing rate of charging goes up to 2.75V/cell. After that the charger come back in trickle mode. In trickle mode, if trickle current goes upto 8 to 12% of the rated current, then the charger changes its mode from trickle to boost. In this mode the charger operates in constant current mode. Starting current is 5A (max) for 40AH Battery. Starting current is 20A (max) for 150AH Battery. Note : Standard charging method for Lead Acid Battery as prescribed by battery manufacturers. **M/S Universal, Mumbai** Boost charge: Battery charging is in constant current mode and current can be adjusted through potentiometers. As per most of the Battery manufacturers they recommend Boost charging is set at 2,70 - 2,75 V/cell. The Battery starts charging at maximum current i.e. 5A for 40AH and 20A for 150AH and current limit is set. As the Battery starts charging the boost current reduces automatically till such time the float voltage is achieved i.e the charger comes back to trickle mode. The Battery can also be charged in two rate method for better performance and life of Battery.	**mode, if trickle current goes upto 8 to 12 % of the rated current excluding steady load current (super-imposed load) on battery, then the charger shall be change its mode from trickle to boost. In this mode the charger shall be operated in constant current mode.** **charger for 150Ah** **Two rate of charging current shall be adjustable between 5 to 20 A through the potentiometers provided on PCB. Starting rate of charging shall be run up to 130V (2.35 V/cell) and then with reduced current, finishing rate of charging shall be up to 151V (2.75V/cell). After that the charger shall be back in trickle mode. In trickle mode, if trickle current goes upto 8 to 12 % of the rated current excluding steady load current (super-imposed load) on battery, then the charger shall be change its mode from trickle to boost. In this mode the charger shall be operated in constant current mode.**
	(v)Load current while boost charging	5A continuously for 40 Ah charger, 20A continuously for 150 Ah charger,	**M/s CONCORD, Lucknow** In place of "Load current while" should be "Total current while" since an additional load of 5A while charging would make the battery charger a 10A charger in place of 5A. It is specified in 2.2 that the load will be 100mA. So 5A +100mA = 5.1A Total current **M/s Electrostar, Kolkata** Total current while boost charging 5A continuously for 40 Ah charger, 20A continuously for 150 Ah charger. **M/S Universal, Mumbai** We understand that it is the TOTAL Charger current 40AH – 5A 150AH – 20A	Comments of M/s CONCORD and M/s Electrostar may be accepted. The heading of para "Load current while boost charging" may be corrected by "Total current while boost charging". The total current (rated boost charge current + super imposed load current) is mentioned. Comment may not be accepted as there is not much difference in battery charger rating. The existing para may be revised as: c. Total current while boost charging: 7A continuously for 40 Ah charger 24A continuously for 150 Ah charger

4.2	The battery charger shall be equipped with suitable filter circuits on the output side to reduce the ripple factor of output voltage to less than five percent at rated current of 5A and 20A each by setting selector switch, when measured across a resistance load. Ripple to be measured at 5A & 20A NOTE: Ripple factor = Superimposed AC rms voltage / D.C. voltage (average	**M/s CONCORD, Lucknow** Ripple to be measured at maximum current rating, Superimposed AC to be measured using an Oscilloscope –Multimeters often give incorrect readings.	Firm comment may be accepted. The existing para may be revised as "T**he battery charger shall be equipped with suitable filter circuits on the output side to reduce the ripple factor of output voltage to less than five per cent at maximum current rating, when measured across a resistance load. Superimposed AC to be measured using an oscilloscope. Ripple to be measured at 7A & 24A. NOTE: Ripple factor = Superimposed AC rms voltage / D.C. voltage (average)"**
4.3	The battery charger shall be designed in such a way that input supply variation in the entire range of 170 to 270 V the output for both trickle and boost charge condition shall not result in an increase or decrease by more than +/-2.5 % of the preset value without any ballast in primary side. Under trickle charge condition, similar requirements shall also be met with by provision of a suitable reactor in the circuit, if considered necessary.	**M/s CONCORD, Lucknow** It will an automatic charger - No ballast is required on the input side **M/S Electrostar, Kolkata** without any ballast in primary side. Note : No reactor required in SCR based charger. **M/S Universal, Mumbai** The Battery charger shall be designed in such a way that input supply variation in the entire range of 170 to 270 V. The output voltage in trickle and boost mode condition shall not increase or decrease by more than ± 2.5 % o the preset value. The above condition will be met without Ballast Choke in primary side.	1. The comment of M/s CONCORD is not understandable. The existing para 4.3 is appropriate. **2.** The comment of M/s Universal, M/s Electrostar may be accepted and existing para revised as "**The battery charger shall be designed in such a way that input supply variation in the entire range of 170 to 270 V the output for both trickle and boost charge condition shall not result in an increase or decrease by more than ± 2.5 % of the preset value"**
5.1	Wiremesh with opening not more than 3mm shall be provided on the inner side of louvers for protection Against entry of lizards , vermin etc.	**M/S Universal, Mumbai** Perforated sheet/wire mesh with opening not more than 3mm shall be provided on the inner side of louvers for protection against entry of lizards, vermin etc etc.	Firm comment may be accepted as an alternative option "perforated sheet" for protection against entry of lizards, vermin etc
5.4	The rectifier transformer shall be double wound, vacuum impregnated, natural air cooled and liberally rated. The core shall be made of low loss silicon steel laminations. The windings shall be of copper with class B insulation. The primary winding of the transformer shall be provided with suitable taps in steps of 20 V ranging from 170V to 270Volt to cater for local adjustment. As an alternative to provision of tapping on primary	**M/s CONCORD, Lucknow** OK. Insulation should be class F. Tappings not required since the charger controls the output voltage by SCR. STR is important to validate transformer quality **M/S Electrostar, Kolkata** The rectifier transformer shall be double wound, vacuum impregnated, natural air cooled and liberally rated. The core shall be made of low loss silicon steel laminations. The windings shall be of copper with class B	The comment of M/s CONCORD and M/s Electrostar for removing transformer tap may be accepted as charger control output voltage by SCR. The suggestion of M/s CONCORD for using class F insulation in transformer may be accepted as F class insulation sustain higher temperature as compared to class B insulation. Existing para may be modified as **"The rectifier transformer shall be double wound, vacuum**

	side, voltage stabilization by ferro resonance method shall also be acceptable.	insulation. Note : Voltage stabilisation will be taken care of by SCR . **M/S Universal, Mumbai** The rectifier transformer shall have no taps in the primary of 20V. The primary core shall be made of low loss silicon steel laminations and the windings shall be of copper with temperature rise restricted to class B.	**impregnated, natural air cooled and liberally rated. The core shall be made of low loss silicon steel laminations. The winding shall be of copper with class F insulation. "** The comment of M/s Universal "no taps in the primary of 20V" may be accepted. The temperature rise restricted to class B has been changed to class F as suggested by M/s CONCORD. Hence, temperature rise restricted to class-B may not be accepted.
5.5	Chokes and ballast shall be of copper winding with class- B insulation and shall be vacuum impregnated..	**M/s CONCORD, Lucknow** Choke with Class F insulation No Ballast is required **M/S Electrostar, Kolkata** Chokes shall be of copper winding with class B insulation and shall be vacuum impregnated. **M/S Universal, Mumbai** Only DC Filter Choke shall be provided with copper winding with temperature rise limited to class B and shall be vacuum impregnated.	The comment of M/s CONCORD for using class F insulation in chokes may be accepted as F class insulation sustain higher temperature as compared to class B insulation. The comments of M/s CONCORD & M/s Electrostar for deletion ballast may be accepted. Existing para may be modified as **"Chokes shall be of copper winding with class-F insulation and shall be vacuum impregnated"** The comments of M/s Universal, M/s CONCORD & M/s Electrostar for deletion ballast may be accepted. Existing para may be modified as "**Chokes shall be of copper winding with class-F insulation and shall be vacuum impregnated"**
5.8	The volt meters and ammeters shall be of flush mounted type of accuracy class 2.5 as per IS: 1248-1968 or latest. Latest digital or Analog meter for each with better accuracy shall be provided.	**M/s CONCORD, Lucknow** Analogue or Digital	Comment may not be accepted as kind of changes required is not understandable.
5.9	The control wiring inside the charger shall be with 1100 V grade PVC insulated copper cable having a minimum cross-section of 2.5 sq. mm for current carrying, voltage sensing and 1.5 sq. mm for electronic portion & confirming to IS: 694-2010. The size of wire for power circuit shall be as per battery charger rating. The cables shall be suitably supported and provided with identification ferrules the connecting points.	**M/s CONCORD, Lucknow** Cross-section as per load current. **M/S Electrostar, Kolkata** The control wiring inside the charger shall be with 1100 V grade PVC insulated copper cable having a minimum cross section of 2.5 sq. mm for current carrying, 0.75 sq. mm. for voltage sensing and 0.5 sq. mm. for electronic portion confirming to IS: 694-2010. The cable shall be suitably supported and provided with identification ferrules at the connecting points. Note : 2.5 Sq.mm for voltage sensing 1.5 Sq.mm for electronic portion cannot be terminated on connector to be fitted on the card.	Comment of the firms may be accepted. Existing para may revised as **"The control wiring inside the charger shall be with 1100 V grade PVC insulated copper cable having a minimum cross-section of 2.5 sq. mm for current carrying, 0.75 sq. mm voltage sensing and 0.5 sq. mm for electronic portion confirming to IS: 694-2010. The size of wire for power circuit shall be as per battery charger rating. The cables shall be suitably supported and provided**

		M/S Universal, Mumbai Battery Charger shall be wired with 1100 V grade PVC insulated copper cable having a minimum cross section of 2.5 sq. mm for power section carrying. Voltage sensing will with 0.75 sq. mm cables. For PCB and other electronic sensing circuits 0.5 sq. mm. cables confirming to IS: 694-2010. The cable shall be suitably supported and provided with identification ferrules at the connecting points.	**with identification ferrules the connecting points."**
5.11 (ii)	It shall have current limiting facility, if the voltage control is in an automatic mode and shall cause a gradual stepped lowering of the output voltage when the DC load current exceeds the load limiting setting.	**M/s CONCORD, Lucknow** Gradual lowering in place of gradual stepped lowering **M/S Electrostar, Kolkata** It shall have current limiting facility, if the voltage control is in an automatic mode and shall cause a gradual lowering of the output voltage when the DC load current exceeds the load limiting setting. **M/S Universal, Mumbai** It shall have current limiting facility, if the voltage control is in an automatic mode and shall cause a stepless lowering of the output voltage when the DC load current exceeds the load limiting setting.	Comment may be accepted and existing para may be corrected as **" It shall have current limiting facility, if the voltage control is in an automatic mode and shall cause a gradual lowering of the output voltage when the DC load current exceeds the load limiting setting."**
5.11 (iii)	The charger shall have an adjustable current limiting facility- brought about by changing the charging voltage in a stepped manner, also for safe guarding the Battery.	**M/s CONCORD, Lucknow** Gradual manner in place of stepped manner **M/S Electrostar, Kolkata** The charger shall have an adjustable current limiting facility brought about by changing the charging voltage, also for safe guarding the Battery. **M/S Universal, Mumbai** The charger shall have an adjustable current limiting facility brought about by changing the charging in voltage in stepless manner.	Comment may be accepted and existing para may be corrected as **"The charger shall have an adjustable current limiting facility- brought about by changing the charging voltage in gradual manner, also for safe guarding the Battery."**
5.11 (iv)	Uniform and smooth stepped adjustments of voltage setting (in both manual and automatic modes) shall be provided.	**M/s CONCORD, Lucknow** Remove 'stepped **M/S Electrostar, Kolkata** Uniform and smooth adjustments of voltage setting (in both manual and automatic modes) shall be provided. **M/S Universal, Mumbai** Uniform stepless adjustments of voltages will be provided in both maul and automatic modes.	Comment may be accepted and existing para may be corrected as "**Uniform and smooth adjustments of voltage setting (in both manual and automatic modes) shall be provided."**

5.11 (v)	During boost charging, the battery charger shall operate on constant current mode best achievable by stepped voltage control	**M/s CONCORD, Lucknow** Remove 'stepped **M/S Electrostar, Kolkata** During boost charging, the battery charger shall operate on constant current mode. **M/S Universal, Mumbai** During Boost charging Battery Charger will be constant current mode and operation will be smooth and stepless.	Comment may be accepted and existing para may be corrected as **" During Boost charging Battery Charger shall be constant current mode and operation shall be smooth and stepless . "**
5.11 (viii)	Soft start feature shall be provided in the system using automatic stepped voltage control	**M/s CONCORD, Lucknow** Remove 'stepped' General Note - Since the Battery charger is now Thyristor based, no need for stepped input and output voltages or related controls. **M/S Electrostar, Kolkata** Soft start feature shall be provided in the system. **M/S Universal, Mumbai** Soft start feature will be stepless voltage control.	Comment may be accepted and existing para may be corrected as **"Soft start feature shall be provided in the system"**
5.12 (i)	The battery charger shall have suitable NO/NC contact for interfacing with RTU to display input mains fail, input fuse fail/MCB trip, output MCB/MCCB trip/fuse fail, DC over voltage, DC under voltage, earth leakage etc. at RCC.	**M/s CONCORD, Lucknow** The battery charger shall have suitable NO/NC contact for interfacing with RTU to display input mains fail, input fuse fail/MCB trip, output MCB/MCCB trip/fuse fail, DC over voltage, DC under voltage, earth leakage, ON/OFF at RCC **M/S Universal, Mumbai** The battery charger shall have suitable RS 485, MODBUS based device for interfacing with RTU to display input mains fail, input fuse fail/MCB trip, rectifier fuse fail, filter fuse fail, output MCB/MCCB trip/fuse fail, charger trip, DC over voltage, DC under voltage, earth leakage etc. at RCC. Battery charger shall also have feature to switch ON/OFF from remote through SCADA system. This will reduce the number of wires form charger to RTU as well as IO points on RTU.	Firm comment may be accepted, the existing paras revised as " **Battery Charger shall have feature to communicate on MODBUS with SCADA system for control (ON/OFF) battery charger, status monitoring, faults i.e. Battery charger fail, input mains fail, input fuse fail/MCB trip, output MCB/MCCB trip/fuse fail, DC over voltage, DC under voltage, earth leakage at RCC through SCADA systems. The input and output voltage (Battery terminal and load terminal) of battery charger shall also be communicated to RCC through SCADA."**
5.12 (ii)	Battery charger shall also have feature to switch ON/OFF from remote through SCADA system only in auto mode.	**M/s CONCORD, Lucknow** SCADA system to be provided to enable all the above functionalities by SCADA as well. The user can decide which system to use. **M/S Electrostar, Kolkata** Battery Charger will consist of MODBUS Communication	

		feature for control (ON/OFF), status monitoring, faults (as per Cl 5.12(i)) monitoring from remote through SCADA systems in auto mode.	
5.12 (iii)	In case of manual to auto mode system shall seamlessly switch.	**M/s CONCORD, Lucknow** Break before make contacts ; remove 'seamlessly' **M/S Universal, Mumbai** In case of switch over from manual to auto mode system shall have manual/off/auto.	Firm comment may be accepted as per justification given by firm. This para may be deleted.
6.0 (viii)	Trickle/boost charge changeover switch along with provision for appropriate Selection of ammeter.	**M/s CONCORD, Lucknow** Not Required since SCR controlled device **M/S Electrostar, Kolkata** Difference between the two clauses not understood.	Firm comment may be accepted as per firm justification. This clause may be deleted.
6.0 (ix)	Trickle/boost charge changeover switch along with provision for appropriate selection of ammeter.	**M/s CONCORD, Lucknow** Not Required – repeat of viii **M/S Universal, Mumbai** 6.0 (ix) & (xiii) Trickle / boost charge changeover switch along with provision for automatic range selection for ammeter. Trickle/boost charge changeover switch along with provision for appropriate selection of ammeter Kindly elaborate the two clauses.	Accepted and this para deleted as this is typographical error.
6.0 (x)	Auto/Manual/OFF selector switch	**M/s CONCORD, Lucknow** Auto/Manual switch – no OFF position OFF achieved by input MCB switch **M/S Electrostar, Kolkata** Auto/Manual selector switch Note : To achieve Clause 5.12(iii) OFF position has to be eliminated .	Comments may be accepted. The "OFF" position may be deleted.
6.0 (xi	Coarse and fine rotary control/switches or step less smooth control through potentiometer for trickle and boost charge.	**M/S Electrostar, Kolkata** Clause to be deleted. Note : No rotary control in this SCR regulated design. **M/S Universal, Mumbai** Clause is contradictory to the system requirement.	Firm comment may be accepted as per justification submitted by firm. This clause may be deleted.
6.0 (xiv)	To be added Add	**M/s CONCORD, Lucknow** ports for all NO/NC contacts	Firm comment may be accepted as communication port is required for interfacing with SCADA system. **A new para added as "RS 485 port for communication with SCADA to control, status and fault alarm display at RCC..**
6.0 (xv)	To be added Add	**M/s CONCORD, Lucknow** ports for all NO/NC contacts RS 485	
7.1.2	No load test: The test shall be carried out at all the six primary tap position by applying appropriate rated primary voltage corresponding to the selected tap position. The DC output	**M/s CONCORD, Lucknow** Transformer has single tappings; Device at no load and under Auto Mode – will switch to Float mode and the Output Voltage is recorded	Firm comment may be accepted and existing para revised as "No load test: **The test shall be carried out at input minimum voltage i.e. 170V and maximum input**

	voltage at no load shall be recorded for the both boost and trickle charge positions by keeping coarse and fine control switches at different steps.	**M/S Electrostar, Kolkata** No load test: The test shall be carried out at input minimum voltage i.e. 170 V and maximum input voltage ie, 270 Volts adjusted through a variac at input side. The dc output voltage in auto trickle mode shall be recorded. Note : No Primary Tap required in SCR based design. **M/S Universal, Mumbai** No load test : The primary will have single winding and no taps. The test shall be carried out by applying AC voltage to the input terminals of Battery Charger at input minimum voltage ie, 170 V and maximum input voltage ie, 270 Volts i.e. only at two positions minimum and maximum voltages. The voltage of Charger to be checked at output terminals at Float mode voltage.	**voltage i.e. 270V adjusted through a variac at input side..”**
7.1.3	The test shall be carried out at all the four primary tap positions by applying appropriate rated primary voltage corresponding to the selected tap position. An adjustable resistance load shall be connected across the output terminals and the output voltage with coarse and fine control switches at different steps shall be recorded by maintaining the load current to the set value as nearly as possible. Change in the set value of load current on account of change in output voltage at different steps shall be readjusted by simultaneously changing the load resistance. The tests shall be carried output individually for minimum and maximum current values specified under trickle and boost charge conditions.	**M/s CONCORD, Lucknow** No tappings available, since the transformer has 2 wires for input and 2 for output **M/S Electrostar, Kolkata** Load test with resistance load : The test shall be carried out by applying the minimum input voltage i.e. 170 V and maximum input voltage i.e. 270 Volts at input terminal through a variac at input side. An adjustable resistance load shall be connected across the output terminals. Load current shall be adjusted to the set value as nearly as possible at both minimum and maximum input voltage. The tests shall be carried out individually for specific current values specified under trickle and boost charge conditions. Note : No rotary control in SCR based design. **M/S Universal, Mumbai** Load test with resistance load : As mentioned above, the test shall be carried out by applying minimum input voltage i.e. 170 V and maximum input voltage i.e. 270 Volts at input terminal of Battery Charger. An adjustable resistance load shall be connected across the output terminals. Load current shall be adjusted to the set value approximately i.e as close to the desired rating of Charger at both minimum and maximum input voltage. The tests shall be carried out individually for specific	Firm comment may be accepted as per justification submitted by the firms. The existing para may be revised as “ **Load test with resistance load : The test shall be carried out by applying the minimum input voltage i.e. 170 V and maximum input voltage i.e. 270 Volts at input terminal through a variac at input side. An adjustable resistance load shall be connected across the output terminals. Load current shall be adjusted to the set value as nearly as possible at both minimum and maximum input voltage. The tests shall be carried out individually for specific current values specified under trickle and boost charge conditions.”** **The universal comment the test shall be carried out at float mode only may not be accepted. This test shall be carried out for both trickle and boost mode.**

		current values specified under Float voltage conditions.	
7.1.7	The test shall be carried out with charger in boost charge position and Output voltage set to maximum. A suitable resistance load shall be connected across the output and load current shall be adjusted to the maximum rated current under boost charge. The ambient temperature, surface temperature of transformer, chokes, SCR and diode base etc. shall be recorded every half an hour till such time the temperature is stabilized (i.e., the temp. rise will not be more than 1 deg. C between consecutive hourly readings). The temp. Rise of transformer winding, choke and ballast measured by the resistance method shall not exceed 50 deg. C. The diode base temp. rise shall be within the prescribed value recommended by the manufacturer.	**M/s CONCORD, Lucknow** No Recording at Ballast as there is no Ballast **M/S Electrostar, Kolkata** Temperature rise test. The test shall be carried out with charger in boost charge position and output voltage set to maximum. A suitable resistance load shall be connected across the output and load current shall be adjusted to the maximum rated current under boost charge. The ambient temperature, surface temperature of transformer, chokes, SCR and diode base etc. shall be recorded every half an hour till such time the temperature is stabilised (i.e., the temp. rise will not be more than 1 deg. C between consecutive hourly readings). The temp. rise of transformer winding, choke measured by the resistance method shall not exceed 50 deg. C. The diode base temp. rise shall be within the prescribed value recommended by the manufacturer **M/S Universal, Mumbai** Temperature rise test : The test shall be carried out with charger in maximum specified voltage and current with help of resistive load bank. The temperature at surface of transformer, choke, SCR/Diode base i.e. Heat sink shall be recorded periodically every half hour till such time the temperature is stabilized such that the temp. rise between two readings is not be more than 1 deg. C. The temp. rise of transformer winding, choke measured by the resistance method shall be as permissible for Class B insulation. The SCR/Diode i.e heat sink temperature rise shall be within the prescribed value as recommended by the semiconductor manufacturer.	Firm comment may be accepted as ballast is not required SCR based battery charger.. The existing para may be revised as "**Temperature rise test. The test shall be carried out with charger in boost charge position and output voltage set to maximum. A suitable resistance load shall be connected across the output and load current shall be adjusted to the maximum rated current under boost charge. The ambient temperature, surface temperature of transformer, chokes, SCR and diode base etc. shall be recorded every half an hour till such time the temperature is stabilised (i.e., the temp. rise will not be more than 1 deg. C between consecutive hourly readings). The temp. rise of transformer winding, choke measured by the resistance method shall not exceed 50 deg. C. The diode base temp. rise shall be within the prescribed value recommended by the manufacturer.**" **M/s universal comment may not be accepted as no justification given by the firm. The temp. rise must be specified well below the class of insulation used. The measuring of temp. at heat sink does not give the correct value of temp. rise of particular component.**
7.2.2	Rated primary voltage shall be applied to the primary of the transformer and the primary and secondary voltages and no-load losses shall be recorded keeping coarse and fine control switches in different positions.	**M/s CONCORD, Lucknow** Coarse and Fine has no defined positions – since it is a potentiometer, We can record at both minimum and maximum combinations for both knobs.	Firm comment may be accepted. The existing para may be revised as "**Open circuit test: Rated primary voltage shall be applied to the primary of the transformer and the primary and secondary voltages and no-load losses shall be recorded keeping potentiometer at maximum and minimum positions.**"
7.2.3	Short circuit test: With the control switches	**M/s CONCORD, Lucknow**	Firm comment may be accepted. The existing

	corresponding to the max. current setting in boost charge position and the secondary shorted, suitable voltage shall be applied to primary to pass the maximum rated current in the primary and the primary voltage, current and power shall be recorded and the full load losses calculated. This shall not exceed the guaranteed value by more than 10 %.	There is no boost charging position. Remove word – boost charging.	para may be revised as " **Short circuit test: With the control switches (potentiometer) set to the max. voltages and the secondary shorted, suitable voltage shall be applied to primary to pass the maximum rated current in the primary and the primary voltage, current and power shall be recorded and the full load losses calculated. This shall not exceed the guaranteed value by more than 10%"**
7.2.4	Prototype of a battery charger conforming to this specification has already been approved in connection with the previous supplies to the Indian Railways, fresh prototype testing may be waived, if it has passed the prototype test earlier and no changes in the design or material used, have been made.	**M/s CONCORD, Lucknow** Fresh Proto type to be done as this a new specification and application is different compare to other chargers used in Indian Railways.	This clause may be deleted because it creates confusion. There is no possibility that before issue specification, any vendor supply battery charger and prototype tested successfully conforming to the specification which is not issued.
New	-	**-**	New para 4.4 added to control output voltage across load terminal. "During Float charging or Boost charging, voltage across the battery terminal may go higher. The higher output voltage of battery charger may damage the equipment connected across load terminal. A suitable automatic solid state transistorized dropping device shall be implemented in battery charger to maintain output voltage 110V±5 Volt DC across load terminal in any case."
New		**-**	New para 6.0 (v) added "Two numbers slide lock type HRC fuses /MCB/MCCB of suitable rating on DC side (Load terminal)"
New	-	**-**	New para 6.0 (xi) added "Step less smooth control through potentiometer for Boost charge current adjustment in auto mode."

New	-	**-**	New para 6.0 (xii) added "Solid state automatic load voltage regulator to maintain the load voltage of 110V±5 Volt DC. The rating of solid state transistorized dropping device shall be 5A continuous and 20A for 30 Sec for 40Ah and 10A continuous and 30A for 30 Sec for 150Ah"
New	-	**-**	New para 6.0 (xvi) added "Fuse fail/MCB/MCCB trip LED indication load and battery terminal."
New	-	**-**	New para 7.1.11 added "Checking of automatic operation Float to Boost, Boost to Float mode as per battery condition."
New	-	**-**	New para 7.1.12 added "Checking of automatic connection of battery to load in case of mains failure or charger trip condition."