Clause No.	Description	Comments Received from	RDSO's remark
1.4	This specification supersedes specification no. ETI/PSI/24 (06/81).	M/s CONCORD There should be a clear STR for this product as proper infrastructure and expertise is required to make Battery Charger.	Noted
4.1 (i)	Type: Two-rate, mono crystalline semi-conductor silicon rectifier type, suitable for floor mounting.	M/s ELECTROSTAR Type: Two rate, mono crystalline semi-conductor silicon controlled rectifier type, suitable for floor mounting.	Comments may be accepted, the words " mono crystalline semi-conductor Silicon rectifier type" replaced by " mono crystalline semi-conductor Silicon controlled rectifier type".
4.1 (iv)	iv)Charging characteristics: a) Trickle charge b) Boost charge Adjustable between 0.5 Amp and 5 amp. In suitable steps at any voltage in the range 115 V to 135 V. Adjustable between 10 Amp and ~~30~~ 40 Amp in suitable steps at any voltage in the range 110 V to 160 V. iv) Charging characteristics: a. Trickle charge <u>Battery charger for 200 Ah battery</u> Adjustable between 0.5A & 5A in suitable steps at any voltage in the range 115 V to 135 V. <u>Battery charger for 250 Ah battery</u> Adjustable between 0.5A & 7A in suitable steps at any voltage in the range 115 V to 135 V. v) Boost charge: <u>Battery charger for 200 Ah battery</u> Adjustable between 10 A and ~~20~~ 25A in suitable steps at any voltage in the range 100 V to 150 V.	M/s CONCORD 1. Adjustable between 10A and 25A for 200AH battery. Adjustable between 10A and 30A for 250AH battery 2. Instead of two separate battery charger, one single battery charger for both types of batteries. 3. The product to be designed as per higher configuration which will be suitable for lower configuration.	Comments may be accepted, 1. Single battery charger for both rating o batteries (200 Ah & 250 Ah) can be developed 2. The rating battery charger shall be designed for higher rating of batteries with suitable adjustment to suit both rating of batteries. 3. Para-iv "Adjustable between 0.5 Amp and 5 amp. In suitable steps at any voltage in the range 115 V to 135 V. Adjustable between 10 Amp and ~~30~~ 40 Amp in suitable steps at any voltage in the range 110 V to 160 V" is deleted because of duplicate entry. 4. Charging characteristic is revised suitably to suit for both rating of batteries. (a) Trickle charge for 200 /250 Ah batteries Adjustable between 0.5A & 7A in suitable steps to suit for both rating of batteries at any voltage in the range 115 V to 135 V. (b) Boost Charge for 200/250 Ah batteries Adjustable between 10 A and 30A in suitable steps to suit for both rating of batteries at any voltage in the range 100 V to 150 V.

	Battery charger for 250 Ah battery Adjustable between 10 A and 30A in suitable steps at any voltage in the range 100 V to 150 V.		
4.1(iv) (a)	Trickle Charge: Battery charger for 200 Ah battery Adjustable between 0.5A & 5A in suitable steps at any voltage in the range 115 V to 135 V. Battery charger for 250 Ah battery Adjusta ble between 0.5A & 7A in suitable steps at any voltage in the range 115 V to 135 V.	M/s ELECTROSTAR Trickle charge : Battery charger for 200Ah & 250AH. Normally the output of the charger shall be 2.15V/ cell adjustable f rom 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.	Comments may not be accepted as there is no clarity about changes required in the existing para.
4.1(iv) (b)	Boost charge: Adjustable between 10 Amp and 30 40 Amp in suitable steps at any voltage in the range 1 l0 V to 160 V. Battery charger for 200 Ah battery Adjustable between 10 A and 20 25A in suitable steps at any voltage in the range 100 V to150 v. Battery charger for 250 Ah battery Adjustable between 10 A and 30A in suitable steps at any voltage in the range 100 Vto 150 V.	M/s ELECTROSTAR Boost charge: Battery charger for 200Ah & 250Ah. 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 comes back in trickle mode. In trickle mode, if trickle current goes opto 8 to 12 % of the rated current, then the charger changes its mode from trickle to boost. In this mode the charger operates in consta nt current mode. Starting current is 25A (max) for 200AH Battery. Starting current is 30A (max) for 250AH Battery.	Comments may not be accepted as there is no clarity about changes required in the existing para.
4.1 (vi)	Load current while boost charging: 25A continuously for 200 AH charger 30A continuously for 250 AH charger	M/s CONCORD Voltage is same only current is variable hence continuous current for different battery can be achieved through selector switch to select battery type.	Comment may be accepted as single battery charge will develop for both rating of batteries.
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 per cent at full load, when measured across a resistance load. NOTE: Ripple factor = Superimposed AC rms voltage /D.C. voltage (average)	M/s CONCORD Ripple to be measured at 25A & 30A	Comments may be accepted as ripple should be measured at rated current.
4.3	The battery charger shall be provided with a suitable ballast on primary side of the rectifier transformer such that 10% increase in primary voltage under boost charge condition shall not result in an increase by more than 25% of the maximum boost charge current to the battery. Under trickle charge condition, similar requirements shall also be met with by provision of a suitable resistor in the circuit, if considered necessary.	M/s ELECTROSTAR The battery charger shall be designed in such a way that input supply variation in the entire range of 17O 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.	Comment may be accepted as changes in output current with changes in input supply voltage is restricted to +/- 2.5% in place of 25%.
5.2	The exterior and base frame of the panel shall be coated with industrially	M/s UNIVERSAL The exterior , **interior** and	Comments may be accepted for exterior, interior and base frame with same color.

	accepted Siemens gray shade and interior surfaces of the panels shall be epoxy powder coated of white color followed by at least 200-degree bake ovening	base frame of the panel shall be coated with industrially accepted Siemens gray shade surfaces of the panels shall be epoxy powder coated followed by at least 200-degree bake ovening. Double colour involves heating the panel twice and should be avoided. Industry practice is to have a single shade on inside and outside surfaces	
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 winding shall be of copper with class A insulation. The primary winding of the transformer shall be provided with suitable taps in steps of 20 V ranging from ~~190~~ 170V to ~~250~~ 270Volt to cater for local adjustment.	M/s CONCORD OK STR is important to validate transformer quality.	Noted
5.5	Chokes and ballast shall be of copper winding with class- A insulation and shall be vacuum impregnated	M/s CONCORD OK STR is important to validate transformer quality. M/s ELECTROSTAR Chokes shall be of copper winding with class B insulation and shall be vacuum impregnated.	1. Comment of M/s CONCORD is noted. 2. Comments of M/s ELECTROSTAR may be accepted as B class insulation for chokes is better as compared to class A insulation.
5.6	The rectifier shall be of the full wave bridge connection using silicon diodes with liberal ratings. The rectifier shall be suitably protected against overloading due to short time heavy currents drawn during closing of the circuit breakers, short circuits, over voltages and against inrush currents when charging full discharged batteries.	M/s ELECTROSTAR The rectifier shall be of full wave half controlled bridge connection using silicon Thyristors and diodes with liberal ratings. The rectifier shall be suitably protected against overloading due to short time heavy currents drawn during closing of the circuit breakers, short circuits, over voltages and against inrush currents when charging fully discharged batteries.	Comments may be accepted
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. and shall have a scale length of not less than 60 mm. Latest digital meter for each with better accuracy shall be provided.	M/s CONCORD Analogue or Digital	Comments may be accepted as its provides flexibility to vendor to provide Analog or digital meters as per their design and reliability of the product.
5.9	The wiring inside the charger shall be with 1100 V grade PVC insulated copper cable having a minimum cross-section of 10 sq. mm and conforming to IS: 694-1977. The cables shall be suitably supported and provided with identification ferrules the connecting points.	M/s ELECTROSTAR 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, 1.5 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	Comments may not be accepted, however, existing para may be corrected 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, 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

		ferrules at the connecting points.	charger rating. The cable shall be suitably supported and provided with identification ferrules at the connecting points".
5.11	The battery charger shall be provided with facility for both automatic and manual control in Float & Boost functions as to be installed at unattended 25 kV & 2x25 kV switching stations. The charger shall be suitable for effecting quick charge to a discharged battery when set to the boost charge position. 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. The current limiting characteristics shall be such that any overload or short circuit in the DC system shall neither damage the charger, nor cause blowing of any of the charger fuses. The charger shall have an adjustable current limiting facility, also for safe guarding the Battery. Uniform and smooth adjustments of voltage setting (in both manual and automatic modes) shall be provided. During boost charging, the battery charger shall operate on constant current mode. A lead acid battery charger should switch to float charge when fully saturated. Soft star feature shall be provided in the system.	M/s CONCORD 1. The battery charger shall be provided with facility for both automatic and manual control – which shall control both Float & Boost functions as to be installed at unattended 25 kV & 2x25 kV switching stations. 2. 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. 3. 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 4. Uniform and smooth stepped adjustments of voltage setting (in both manual and automatic modes) shall be provided. 5. During boost charging, the battery charger shall operate on constant current mode best achievable by stepped voltage control. 6. The current limiting characteristics shall be such that any overload or short circuit in the DC system shall not damage the charger, and will lower the output voltage immediately to avoid blowing of any of the charger fuses. To prevent any failures of the automation platform creating hazards in the field, it is recommended that fuses blow rather than risk life and high voltage output. 7. A lead acid battery charger should switch to float charge when fully saturated when operating in automatic mode. 8. Soft start feature shall be provided in the system using automatic stepped voltage control.	Comments may be accepted for more clarity about functional requirement of battery charger.
5.12	The battery charger shall have suitable NO/NC contact 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.	M/s CONCORD 1.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. 2. Battery charger shall also have feature to switch ON/OFF from remote through SCADA system only in auto mode. 3. In case of manual to auto mode system shall seamlessly switch.	Comments may be accepted for more clarity about functional requirement of battery charger.

		M/s UNIVERSAL 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 The meters can also have RS 485 ports so that on 2 wires all information can be gathered by RTU	Comments may not be accepted as its require design and development of IED.
6.0 (iii)	A double pole miniature circuit breaker along with a backup slide lock type rewireable fuse on ac side	M/s CONCORD Fuse should be HRC type	Comments may be accepted as HRC fuse is better than rewireable fuse.
6.0 (iv)	Two numbers slide lock type rewireable fuses on dc side.	M/s CONCORD Fuse should be HRC type	Comments may be accepted as HRC fuse is better than rewireable fuse.
6.0 (vi)	~~One moving coil~~ digital ammeter 0-15A/0-~~15~~ 45 A dual range ~~along with shunts~~ setting	M/s CONCORD Separate trickle and boost meter instead of dual rating	Comments may be accepted. The both separate and dual range ammeter may be permitted.
6.0 (viii)	Trickle/boost charge changeover switch along with provision for automatic range selection for ammeter.	M/s CONCORD Trickle/boost charge changeover switch alongwith provision for appropriate selection of ammeter.	Comments may be accepted.
6.0 (x)	Coarse and fine rotary control/switches for trickle and boost charge.	M/s ELECTROSTAR Step less smooth control through potentiometer shall be provided for both trickle and boost charging.	Comments may be accepted and both option may be permitted.
6.0 (xi)	Rotary control switch for regulating current in trickle charge	M/s CONCORD Not required M/s ELECTROSTAR Step less smooth control through potentiometer shall be provided for trickle voltage adjustment in Auto mode on the PCB.	Both comments may be accepted.
6.0 (xiv)		M/s CONCORD Port for connection of battery wires to be added	Comments may not be accepted as this is not understandable.
6.0 (xv)		M/s CONCORD Port for communication with SCADA to be added.	Comments may not be accepted as interfacing of battery charger with RTU will be done through NO/NC contact available on the battery charger.
7.0		M/s UNIVERSAL **Type tests 7.1.1 to 7.1.7 to be repeated in AUTO mode**	Comments may be accepted as 7.1.2 to 7.1.7 is required to be carried out in manual and auto mode separately to verify function of battery charger.
7.1.2	No-load test The test shall be carried out at all the four primary tap position by applying appropriate rated primary voltage corresponding to the selected tap position. The dc output voltage at no load shall be recorded for the both	M/s ELECTROSTAR No load test: The test shall be carried out at input minimum voltage ie, 170 V and maximum input voltage ie, 270 Volts adjusted through a variac at input side.	Comment may not be accepted as this test shall be carried out at all tap position

	boost and trickle charge positions by keeping coarse and fine control switches at different steps. Load tests with resistance load.	The dc output voltage at no load shall be recorded for both trickle and boost position.	
		M/s UNIVERSAL The test shall be carried out at all the **SIX** primary tap positions by appropriate rated primary voltage corresponding to the selected tap position Since the input range is increased and the taps are stilll at 20V difference the number of taps will increase 170,190,210,230,250 and 270	Comments may be accepted to verify out put at no load at all tap position.
7.1.3	Load tests with resistance load. 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 out individually from minimum and maximum current values specified under trickle and boost charge conditions:	M/s ELECTROSTAR 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' The dc outPut load shall be recorded to the set value as nearlY as possible in both minimum and maximum voltage' Change in the set value of load current on account of change in outPut voltage at different stePs shall be readiusted bY simultaneously changing the load resistance' The tests shall be canied out individuallY for minimum and maximum cunent values specified under trickle and boost charge.	Comment may not be accepted as load test should be carried out at all taps.
7.1.6	Stability test The test shall be carried out to ascertain that the battery charger satisfies the requirements indicated in cl. 4.3 of this specification. It shall be sufficient to carry out the test at any of the primary tap positions; however, the 230 V primary tap position shall be preferred for the test. The incoming supply voltage shall be adjusted to rated voltage and coarse and fine control switches set to the maximum position in order to get maximum output voltage. An adjustable resistance load shall be connected across the output terminals and the load current shall be adjusted to the maximum rated value. The incoming supply voltage shall then be increased by 10%. Any increase in output voltage shall be offset by increasing the load current by readjusting the load resistance thereby keeping the output voltage unchanged. This increase in load current shall represent the increase in the charging current to the battery on account of increase in primary voltage if this battery was connected across the charger. The test shall be separately carried out for trickle and boost	M/s ELECTROSTAR Stability test: Test shall be carried out to ascertain that the batterY charger satisfies the requirements indicated in cl. 4.3 of this specification. It shall be sufficient to carry out the test at any input voltage, however, 240V AC inp ut voltage shall be preferred for this test. At nominal voltage 240V AC input, the output voltage and current shall be adjusted through resistance load for setting required value. In this condition note down the output voltage and current in respect of nominal voltage i.e. 24OV AC input. Then increase the input supply voltage upto 270V AC by adjusting input manual variac, the output voltage and current shall again be noted down, The test sha ll be separately carried out for trickle and boost charge condition and percentage increase in charging current on account of 270V AC supply voltage shall not exceed 2.5%.	Comments may be accepted.

	charge condition and percentage increase in charging current on account of 10 % increase in supply voltage calculated.		
7.1.7	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, ballast 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 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 ELECTROSTAR 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.	Comments may be accepted
7.4		M/s CONCORD Prototype for auto mode to be added (i)Load/no load and efficiency test. (ii)Re-create all failure cases of clause no. 5.12 and ensure proper functionality of NO/NC relay system	Comments may be accepted as functional verification in auto mode is required. Para 7.1.10 added.
8.2	No. load test The test shall be carried out in accordance with the cl. 7.1.2 except that the tests shall be carried out only the rated input voltage of 230 V ac.	M/s ELECTROSTAR No load test: The test shall be carried out in accordance with the cl. 7.1.2 except that the tests shall be carried out only at the rated input voltage of 240 ac.	Comments may be accepted as rated input voltage 240 V is correct.
8.3	Load test with resistance load The tests shall be carried out in accordance with cl. 7.1.3 except that the tests shall be carried out only at the rated input voltage of 230 V ac.	M/S ELECTROSTAR Load test with resistance load: The tests shall be carried out in accordance with cl. 7.1.3 except that tests shall be carried out only at the rated input voltage of 240 V ac.	Comments may be accepted as rated input voltage 240 V is correct.
8.6		M/s CONCORD Clause no. 8.6 to be added for testing of battery charger in auto mode.	Comments may be accepted.