

RAJASTHAN RAJYA VIDYUT UTPADAN NIGAM LIMITED

2X660 MW SURATGARH STPP

VOLUME – IIB

TECHNICAL SPECIFICATION

FOR

220V DC BATTERY CHARGER

SPECIFICATION NO: *PE-TS-392-508-E002*

REVISION: *0*



BHARAT HEAVY ELECTRICALS LIMITED

POWER SECTOR

PROJECT ENGINEERING MANAGEMENT

NOIDA, UP (INDIA) – 201301



**TECHNICAL SPECIFICATION FOR
220V DC BATTERY CHARGER**

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VOLUME II B

SECTION

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TOTAL NO. OF SHEETS =51 (INCLUDING COVER/ SEPARATOR SHEETS)

**IT IS CONFIRMED THAT OUR TECHNICAL OFFER COMPLIES WITH THE SPECIFICATION IN TOTO, & THAT
THERE ARE NO TECHNICAL DEVIATIONS.**

BIDDER'S STAMP & SIGNATURE



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INSTRUCTIONS TO BIDDERS FOR PREPARING TECHNICAL OFFERS

1. In line with clause no. 9.1 of Section-C, Volume-II-B of the specification, two signed and stamped copies of the following shall be furnished by all bidders as technical offer:
 - a. Unpriced Price Schedule (Annexure-A: BOQ & price schedule, as enclosed with the specification) with bidder's signature and company stamp.
 - b. A copy of this sheet ("Instructions to Bidders for Preparing Technical Offer"), with bidder's signature and company stamp.
 - c. A copy of previous sheet ("List Of Contents"), with bidder's signature and company stamp.
 - d. A copy of next sheet ("Deviation Schedule"), with "NO DEVIATION" and bidder's signature and company stamp.
2. No technical submittal such as copies of type test certificates, data Sheets, write-up, drawing, technical literature, etc. is required during tender stage. Any such submission, even if made, shall not be considered as part of offer.
3. Confirmations/ comments (if any) regarding delivery schedules shall be furnished as part of the commercial offer. Any reference elsewhere/ covering letter of technical offer shall not be considered by BHEL.
4. Any comments/ clarifications on technical/ inspection requirements furnished as part of bidder's covering letter shall not be considered by BHEL, and bidder's offer shall be construed to be in conformance with the specification.
5. Any changes made by the bidder in the price schedule with respect to the charger description/ quantities, notes etc. from those given in Annexure-A to Section-C of specification [Bill Of Quantities] shall not be considered (i.e., technical description, quantities, notes etc. as per specification shall prevail).

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DEVIATION SCHEDULE

SL. NO.	CLAUSE NO.	DEVIATION	REASONS FOR DEVIATION

It is certified that the offer is fully in conformance to the specification requirements except for the deviations, which are specifically brought out in the above prescribed Deviation Schedule.

Signature & seal of Bidder's authorized representative



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PREAMBLE

1.0 The Tender documents contains three (3) volumes. The bidder shall meet the requirements of all three volumes.

1.1 VOLUME - I CONDITIONS OF CONTRACT

This consists of four parts as below:-

Volume – IA This part contains Instructions to bidders for making bids to BHEL.

Volume – IB This part contains General Commercial Conditions of the Tender & includes provision that vender shall be responsible for the quality of item supplied by their sub-vendors.

Volume – IC This part contains Special Conditions of Contract.

Volume – ID This part contains Commercial conditions for Erection & Commissioning site work, as applicable.

1.2 VOLUME – II TECHNICAL SPECIFICATION

Technical requirements are stipulated in Volume – II, which comprises of:-

Volume – IIA General Technical Conditions.

Volume – IIB Technical Specification including Drawings, if any.

1.3 VOLUME – IIB

This volume is sub-divided in to following sections:-

Section – A This section outlines the Intent of Specification

Section – B This section provides “Project Information”.

Section – C This section indicates Technical Requirements specific to Contract.

Section – D: This section comprises of Technical requirements specific to Contract.

Data sheet - A :- Specific data and other requirements pertaining to the equipments.

Data sheet – C :- Indicates data / documents to be furnished after the award of Contract as per agreed schedule by the vendor (as applicable)



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SECTION-A

SCOPE OF ENQUIRY

- 1.0 This specification covers the design, manufacture, inspection and testing at manufacturer's works, proper packing and delivery to site of **220V DC Battery Charger** as mentioned in different sections of this specification for 2x660 MW SURATGARH STPP.
- 2.0 It is not the intent to specify herein all the details of design & manufacture. However, the equipment shall conform in all respects to high standards of design engineering and workmanship and shall be capable of performing in continuous commercial operation up to bidder's guarantee.
- 3.0 The general terms and conditions, instructions to bidders and other attachment referred to elsewhere are hereby made part of the Technical Specification.
- 4.0 The bidders shall be responsible for and governed by all requirements stipulated hereinafter.
- 5.0 Bidders shall confirm total compliance to the specification without any deviations from the technical/ quality assurance requirements stipulated.
- 6.0 The documents shall be in English language and MKS system of units.



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**SECTION-B
PROJECT INFORMATION**

RAJASTHAN RAJYA VIDYUT UTPADAN NIGAM LTD
2X660 MW SURATGARH STPP
PROJECT INFORMATION

1.0	Owner	Rajasthan Rajya Vidyut Utpadan Nigam Ltd., Jaipur
2.0	Consulting Engineer	TATA Consulting Engineers Ltd. 73/1, St. Marks Road, Bangalore – 560 001 Tel : 080 – 6622 6000 Fax : 080 – 22274874
3.0	Location of the plant	Prabat Nagar, Suratgarh Sriganganagar district, Rajasthan.
4.0	Latitude and longitude	Latitude : 29 deg. 10 min. N Longitude : 74 deg.01 min. E
5.0	Elevation above mean sea level	186 m (approximate)
6.0	Climatic conditions	
6.1	Temperatures : Monthly basis	
	Mean of daily max.	32.8 deg.C (in the month of May)
	Mean of daily min.	17.6 deg.C (in the month of Jan)
6.2	Temperatures : Annual basis	
	Mean of daily max.	32.3 deg.C
	Mean of daily min.	19.6 deg.C
	Highest temperature recorded	50 deg.C
	Lowest temperature recorded	(-) 2.8 deg.C
	Design Ambient Temperature for Electrical Equipment design	50 deg C
6.3	Relative humidity	Varies between 21% and 81%
6.4	Annual average rain fall	312 mm
6.5	Annual mean wind speed :	4 km / hr.
7.0	Wind load	

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	Calculations for wind effect shall be in accordance with IS:875-1987(Part-3) taking into account the following:	
	a) Basic wind speed = 47 m/sec	
	b) Factor K1 = 1.07	
	c) Category of terrain = Category 2	
	d) K3 – as per IS 875	
8.0	Seismic data (As per IS: 1893 latest issue)	
	a) Zone	Zone II
	Designs & design coefficients shall be based on IS 1893:2002	
	Design condenser cooling water inlet temperature	33 Deg C
9.0	Auxiliary power supply:	
	Auxiliary electrical equipment to be supplied against this specification shall be suitable for operation on the following system:	
	a) For motors rated 160 kW and below.	415V AC, 3-phase, 3-wire effectively earthed.
	b) For motors rated above 160 kW and up to 1500 kW	6600V AC, 3-phase, 3-wire, 50 Hz, non-effectively earthed
	c) For motors rated above 1500kW	11000V AC, 3-phase, 3-wire, 50 Hz, non-effectively earthed
	d) For motor control centres	415V AC, 3-phase, 3/4-wire effectively earthed.
	e) DC motor starters, DC solenoids, DC alarm control and protection	220 V DC, 2-wire unearthed
	f) AC control & protective devices	110 V 1 phase, 50Hz, 2 wire AC supply. The single phase 110V AC supply shall be derived by VENDOR by providing 415V / 110 V Control transformers of adequate rating with MCCB / MCB on both the primary and secondary sides.
	g) Uninterrupted power supply	230 V, 1-phase, 50 Hz, 2-wire, AC

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		supply (For all instrumentation and control system equipment and solenoid valves)
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- g) Lighting fixtures and space heaters 240 V, 1 phase, 2 wire, 50Hz, solidly earthed system
- h) Construction supply 415 V, 3 phase, 4 wire, 50Hz AC supply with neutral lead solidly earthed.

- i) The above voltages may vary as follows :

All devices shall be suitable for continuous operation over the entire range of voltage and frequency indicated below without any change in their performance.

AC supply

Voltage variation $\pm 10\%$
Frequency variation $\pm 5\%$


Combined voltage & frequency variation 10%

- DC supply
- j) For instrument and control system of steam generator and steam turbine generator.

Voltage variation +10% , -15%

230 V $\pm 5\%$ AC UPS, 1-phase, 50 Hz, 2-wire. The 24 V DC required for control system shall be generated from this UPS.

- 10.0 All the electrical equipment shall be designed for 50° C reference ambient temperature.

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SECTION –C

SPECIFIC TECHNICAL REQUIREMENTS

1.0 SCOPE OF ENQUIRY

- 1.1 This enquiry covers the supply of **220V DC BATTERY CHARGER** conforming to this specification.
- 1.2 General technical requirements of the **220V DC BATTERY CHARGER** are indicated in Section-D. Project specific technical/ quality requirements / changes are listed in Section-C & Data Sheet-A.
- 1.3 The stipulations of Section-C, followed by those of Data Sheet-A shall prevail in case of any conflict between the stipulations of Section-C, Data Sheet - A & Section-D.

2.0 BILL OF QUANTITIES:

- 2.1 Quantity requirements shall be as per **Annexure-A (BOQ cum Price Schedule)** enclosed.

3.0 SPECIFIC REQUIREMENTS:

- 3.1 Technical:

S. No.	Reference clause No. of Section D (if any)	Specific Requirement/ Change
1.0	3.1	<p>Under normal conditions, when the AC supply is healthy at the battery charger input terminals, the charger shall remain in float mode supplying the continuous DC loads. Over and above the continuous DC loads the charger in float mode shall also supply the necessary trickle charge to the battery, to keep the later in fully ready condition for being available during AC supply failure at charger terminals. Also some of the impulse loads of duration less than a minute for which the response of the charger is poor, shall be supplied by the associated battery in the DC system. This impulse discharge, shall, however, be continuously replenished by the float charger, unless the discharge is of considerable magnitude, in the event of which the charger shall operate in boost mode.</p> <p>Further, under normal conditions, bus coupler will be kept open with each float cum boost charger will feed 50% of the total load and trickle charging current of the respective battery. In case of total AC supply failure in the plant or power supply failure to the charger, the respective battery will meet the corresponding loads. In case one of the chargers require repair/ maintenance, then all the DC loads are transferred to the healthy battery charger by isolating the corresponding incomer to the DCDB and closing the bus coupler. During this period, if there is an AC</p>



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		supply failure, the battery which is connected to the healthy charger will feed 100% loads. After restoration of the AC supply, the fully/ partly discharged battery will be recharged one at a time using the corresponding boost charger. During this time, the charger will be disconnected from the loads, by opening the DCDB incomer and 100% of the loads will be fed from the other charger.
2.0	4.1	The battery chargers shall be self regulating , natural air cooled, static type based composed of silicon controlled rectifiers (SCRs)/IGBT connected in three phase full wave full control bridge circuit.
3.0	4.4	The battery chargers as well as their automatic regulators shall be of static type. The battery chargers shall be capable of continuous operation at the respective rated load in float charging mode i.e. trickle charging the associated DC batteries while supplying the DC loads.
4.0	4.14	This clause is NA.
5.0	5.8	For all chargers, DC ammeter, DC voltmeter and AC voltmeter shall be provided in 96 x 96 mm ² size with 0.5 accuracy class conforming to IS-1248. The instruments shall be flush mounted type, dust proof, moisture resistant and have easy accessible means for zero adjustment. Meters shall have 4 digit-7 segment LED/LCD display and RS 485 Serial Bus port. Further, the charger shall essentially comprise the following items: a) One (1) moving coil DC voltmeter and ammeter of size 96x96 mm of suitable range for float cum boost chargers. Necessary shunts for local and remote metering shall be provided. b) One (1) moving coil centre zero ammeter, with shunt, size 96x96 mm to read discharge/ charge current of the battery.
6.0	5.17	<u>Panel Construction</u> The charger panels housing all the equipment shall be indoor, floor mounting, air natural cooled, self-supporting sheet metal enclosed cubicle type. The charger panel and its frame shall be fabricated from 2.0 mm cold rolled sheet steel and have folded type construction. The bidder shall also supply necessary base frames, anchor bolts and hardware. Removable undrilled gland plates of at least 3.0 mm thick sheet steel and lugs for all cables shall be provided. The lugs for cables shall be made of electrolytic tinned copper. The gland plate shall be of adequate size for accommodating requisite number of cable glands for power and control cables. The charger shall be tropicalised and vermin proof. Ventilation louvers shall be backed with fine brass wire mesh. All door and covers shall be fitted with synthetic rubber/Neoprene gaskets. The panels shall have hinged double



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		leaf doors provided on front and backside for adequate access of charger terminals. All the charger cubicle doors shall be properly earthed. The panels shall comply with at least degree of protection IP-42. Incoming and outgoing cables shall enter from bottom. Suitable cable <i>terminal with Heavy duty bolt-on termination tinned copper lugs of compression with long barrel type</i> and double compression brass nickel-plated cable glands shall be provided (which shall be in Battery Charger Vendor scope) in each panel for incoming and outgoing cables.
7.0	5.25	<p><u>Cable Lugs</u> Heavy duty bolt-on <i>termination tinned copper lugs of compression with long barrel type</i> shall be used in the Charger for power cable termination. The supply of tinned copper cable lugs for power cables forms part of the supply of equipment. Cable lugs shall comply with <i>applicable IS</i>.</p>
8.0	6.1	<p>Fault indicating lamps shall be provided on the charger cubicle and following initiating contacts shall be provided for remote alarm for each of the float cum boost chargers. The alarms shall be provided on the CRT in the common control room.</p> <ul style="list-style-type: none"> a) AC supply failure b) AC input fuse failure (separate for FCBC/Float/Boost) c) AC Under voltage <i>and current limit protection</i> d) Rectifier fuse failure e) Charger failure f) Surge circuit fuse failure g) Filter condenser fuse failure h) Blocking Diode failure i) Load limiter operated j) Charger trip/over loaded k) Battery on boost l) Battery fuse blown m) Boost Bus Overvoltage n) DC system under voltage/over voltage <u>o) DC output fuse blown</u> <u>p) Over voltage protection</u> <u>q) Over current protection</u> <p>for all the above alarms, a group alarm for each charger shall be provided on the back up panel.</p>
9.0	10.6	Following routine tests are to be performed on all battery chargers:



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		<p>i) Complete physical examination including wiring checks and functional checks.</p> <p>ii) Temperature rise test on complete charger at full load.</p> <p>iii) Insulation resistance test (with 500V meggar).</p> <p>iv) High voltage test, excluding electronic controller, at 2kV AC for one min.</p> <p>v) Ripple content test at no load, half and full load.</p> <p>vi) AVR operation test at specified AC supply variation from 0-100% loads.</p> <p>vii) Load test to show the charger can deliver the rated duty without current limiter device operating.</p> <p>viii) Checking of proper operation of annunciation system.</p> <p>ix) Dynamic response test Overshoot / undershoot in output voltage of the charger corresponding to sudden change in load from 100% to 20% and from 20% to 100%.</p> <p>x) Burn in test shall be carried out on all electronic modules or panels with modules. During the test the panel / module shall be subjected to ambient temperature of 50°C for 48 hours in energised condition. The temperature rise inside the cubicle shall not exceed 10°C during the test.</p> <p>xi) Degree of protection test The charger shall be checked for gasket arrangement as per the drawings.</p> <p>xii) Efficiency and power factor measurement.</p> <p>xiii) demonstration of guaranteed efficiency and power factor.</p>
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3.2 Quality/ Inspection:

S. No.	Reference clause No. of Section D (if any)	Specific Requirement/ Change
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ANNEXURE-A						
BOQ-cum-PRICE SCHEDULE FOR 220V DC BATTERY CHARGER						
Sr. No.	Item code	Item Description	Unit	Quantity	Unit Price (Rs.)	Total Price (Rs.)
(A)	MAIN ITEMS					
1.0		CHARGER				
1.1	508-12010-A	FLOAT CUM BOOST CHARGER1 (520A)	NOS	4		
1.2	508-12011-A	FLOAT CUM BOOST CHARGER1 (320A)	NOS	2		
1.3	508-12012-A	FLOAT CUM BOOST CHARGER1 (80A)	NOS	2		
2.0	508-12001-A	FUSE BOX				
2.1		FUSE BOX: BATTERY FUSE OF 1000A ENCLOSED IN SHEET STEEL ELCLOSURE THAT IS PAINTED WITH ANTIACID/ ANTIALKALI PAINT ALONG WITH SUPPORTING STRUCTURE	NOS	4		
2.2		FUSE BOX: BATTERY FUSE OF 200A ENCLOSED IN SHEET STEEL ELCLOSURE THAT IS PAINTED WITH ANTIACID/ ANTIALKALI PAINT ALONG WITH SUPPORTING STRUCTURE	NOS	2		
2.3		FUSE BOX: BATTERY FUSE OF 50A ENCLOSED IN SHEET STEEL ELCLOSURE THAT IS PAINTED WITH ANTIACID/ ANTIALKALI PAINT ALONG WITH SUPPORTING STRUCTURE	NOS	2		
3.0	508-12005-A	DISCHARGE RESISTOR				
3.1		DISCHARGE RESISTOR WITH SHUNT SUITABLE FOR 10 HOUR DISCHARGE RATE FOR 2860 AH LEAD ACID PLANTE BATTERY	NOS	1		
3.2		DISCHARGE RESISTOR WITH SHUNT SUITABLE FOR 10 HOUR DISCHARGE RATE FOR 2100 AH LEAD ACID PLANTE BATTERY	NOS	1		
3.3		DISCHARGE RESISTOR WITH SHUNT SUITABLE FOR 10 HOUR DISCHARGE RATE FOR 500 AH LEAD ACID PLANTE BATTERY	NOS	1		
4.0	508-12006-A	E & C SPARES	SET			
4.1		FUSE LINK WITHOUT HOLDER				
a		AC I/P HRC FUSE LINK	NOS	6		
b		CONTROL HRC FUSE LINK	NOS	6		
c		RECTIFIER FUSE LINK	NOS	6		
d		FILTER CAPACITOR FUSE LINK	NOS	6		
e		DC O/P FUSE LINK	NOS	6		
4.2		INDICATING LAMP				
a		AC I/P LAMP RED COLOR	NOS	6		
b		AC I/P LAMP YELLOW COLOR	NOS	6		
c		AC I/P LAMP BLUE COLOR	NOS	6		
d		DC O/P LAMP	NOS	6		
5.0	508-12016-A	MANDATORY SPARES for FLOAT CUM BOOST CHARGER (ONE SET FOR EACH RATING OF CHARGER)				
a)		Power supply unit	No. of each type	1		

b)		Control Fuses	Nos. of each type & rating	2		
c)		Power semiconductor	Set for Converter system	1		
d)		Semiconductor fuses of each rating	No.	1		
e)		Auxiliary Relays of each type	No.	1		
f)		Filter capacitor of each type and rating	Set	1		
g)		Filter choke	No.	1		
h)		Annunciation Window	Set	1		
i)		Electronic cards	Nos. of each type and rating which are interchangeable	2		
j)		Contactor	One of each type and rating	1		
k)		MCCB	One of each type and rating	1		
6.0	508-12018-A	O&M SPARES (APPLICABLE FOR THREE YEARS OF OPERATION, LIST SHALL BE PROVIDED BY VENDOR)	LOT	1		
7.0	508-12024-A	TYPE TEST				
7.1		HEAT RUN TEST (ON EACH RATING OF FCB CHARGER)	LOT	1		
(B)	OPTIONAL ITEMS					
1.0	508-12014-A	INCREMENTAL DISCHARGE RESISTOR RATING	NOS			Unit rate of discharge resistor capacity increase/decrease by 20A
2.0	508-12015-A	INCREMENTAL FLOAT CUM BOOST CHARGER RATING	NOS			Unit rate of battery charger capacity increase/decrease by 20A
3.0	508-12020-A	SUPV.OF E&C	SET			Supervision of E & C activities of 220V DC Float & Boost charger
NOTE:- All Cable Gland and Lugs at Charger, fuse box & discharge resistor end are in Bidder's Scope.						



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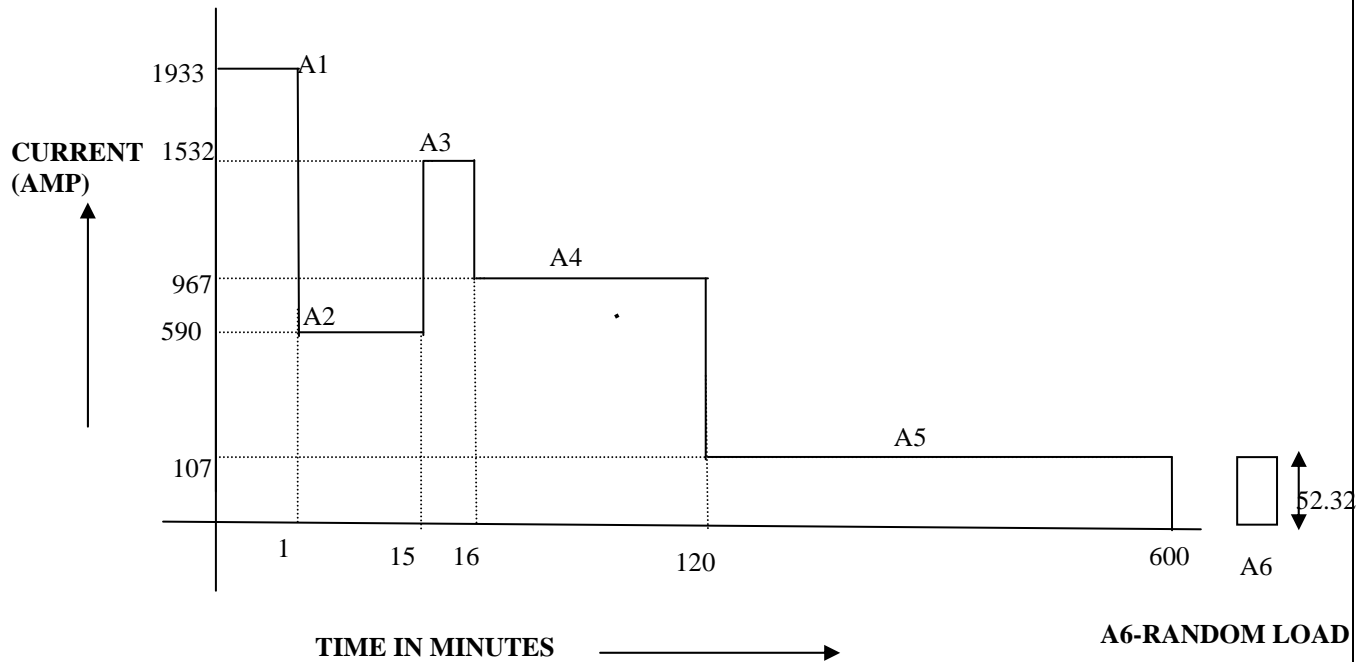
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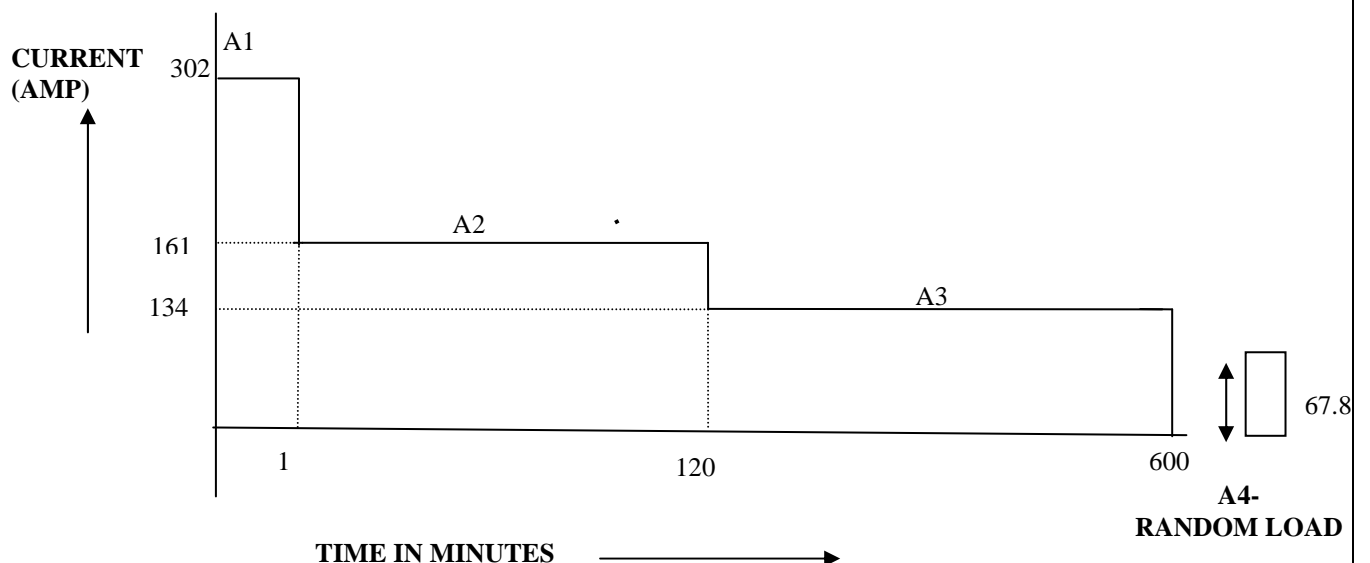
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ANNEXURE-B LOAD DUTY CYCLE - 220V UNIT DC SYSTEM



LOAD DUTY CYCLE - 220V STATION DC SYSTEM





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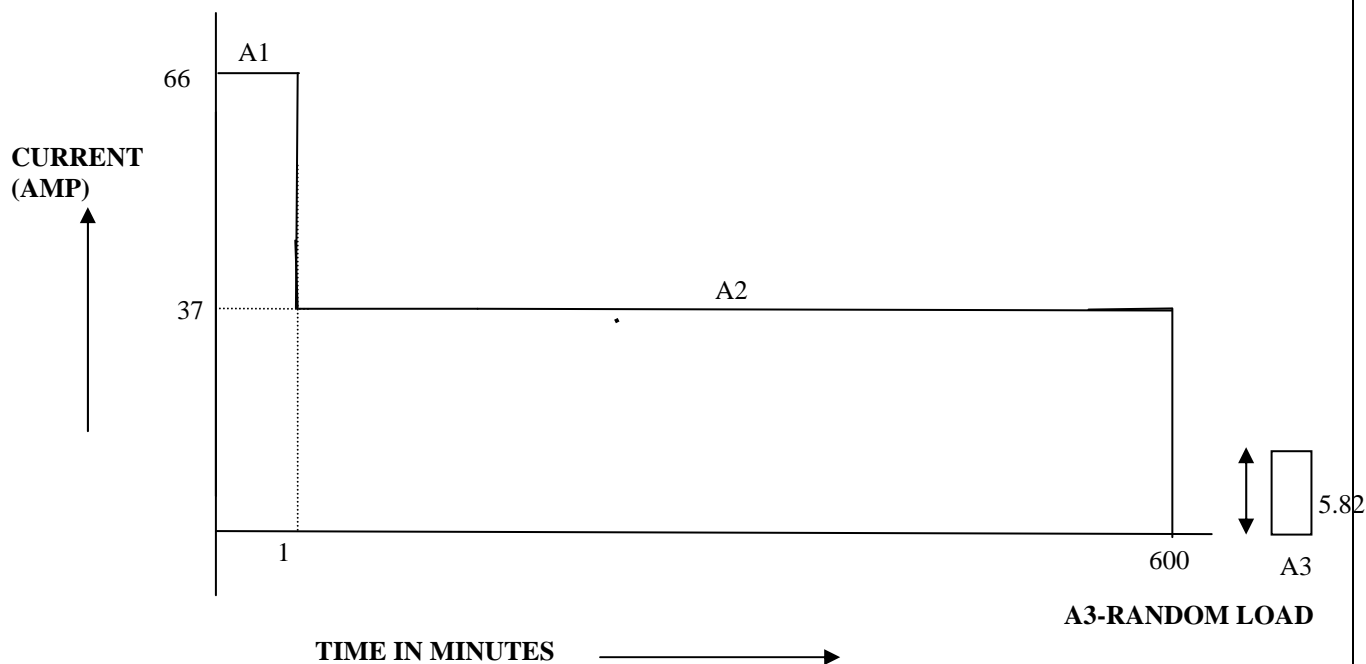
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LOAD DUTY CYCLE - 220V RIVER WATER INTAKE DC SYSTEM





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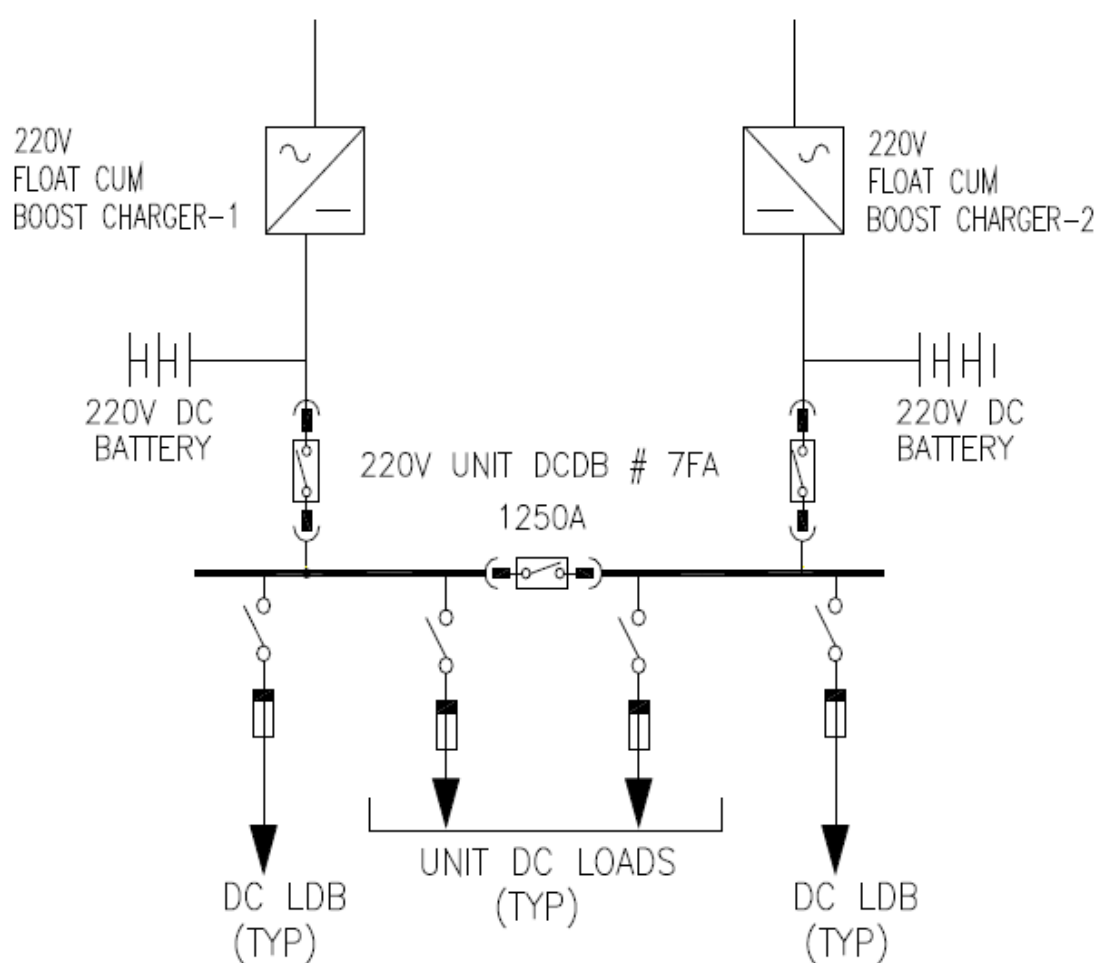
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ANNEXURE-C

ONE LINE DIAGRAM FOR 220 V UNIT DC SYSTEM





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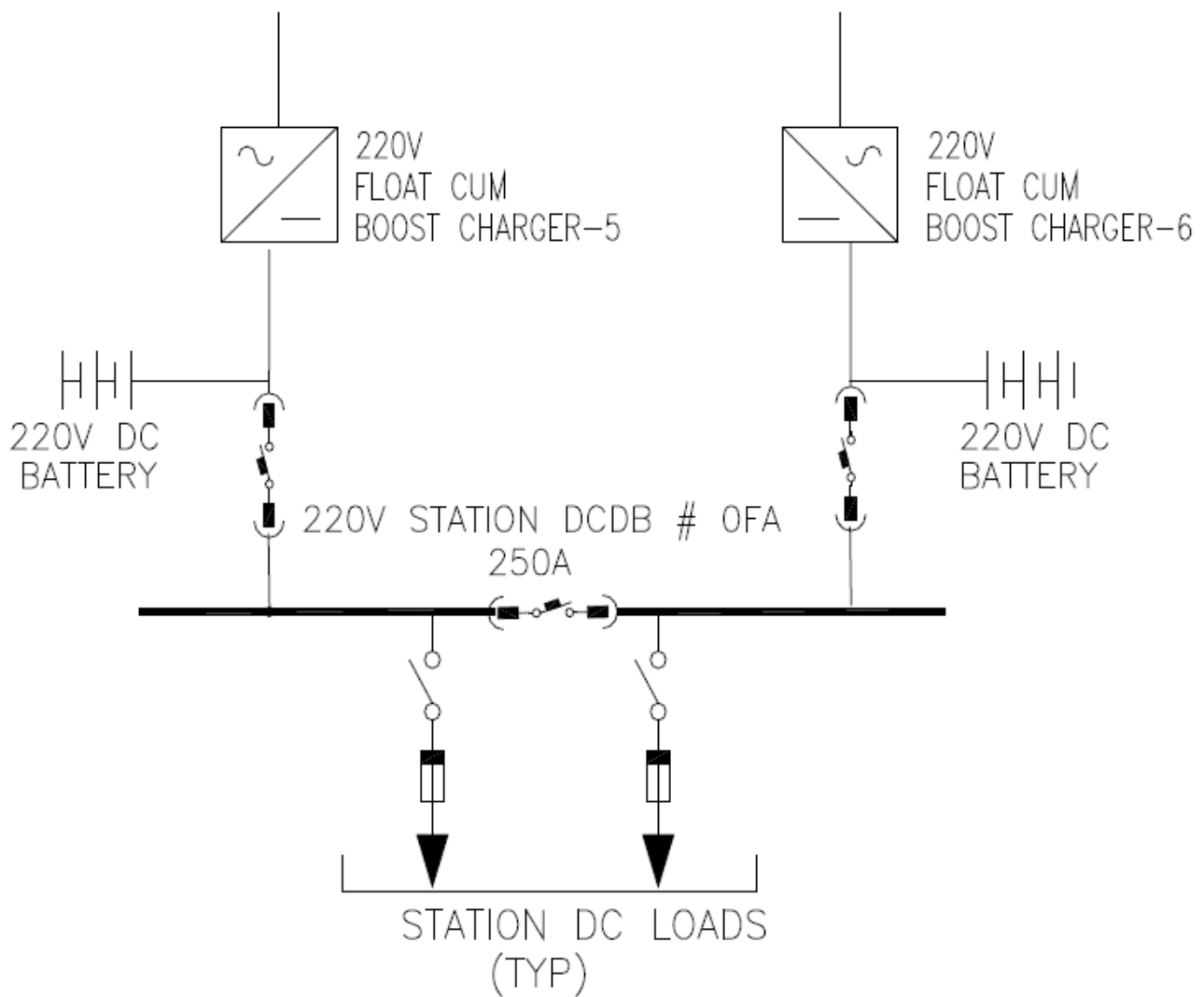
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ONE LINE DIAGRAM FOR 220 V STATION DC SYSTEM





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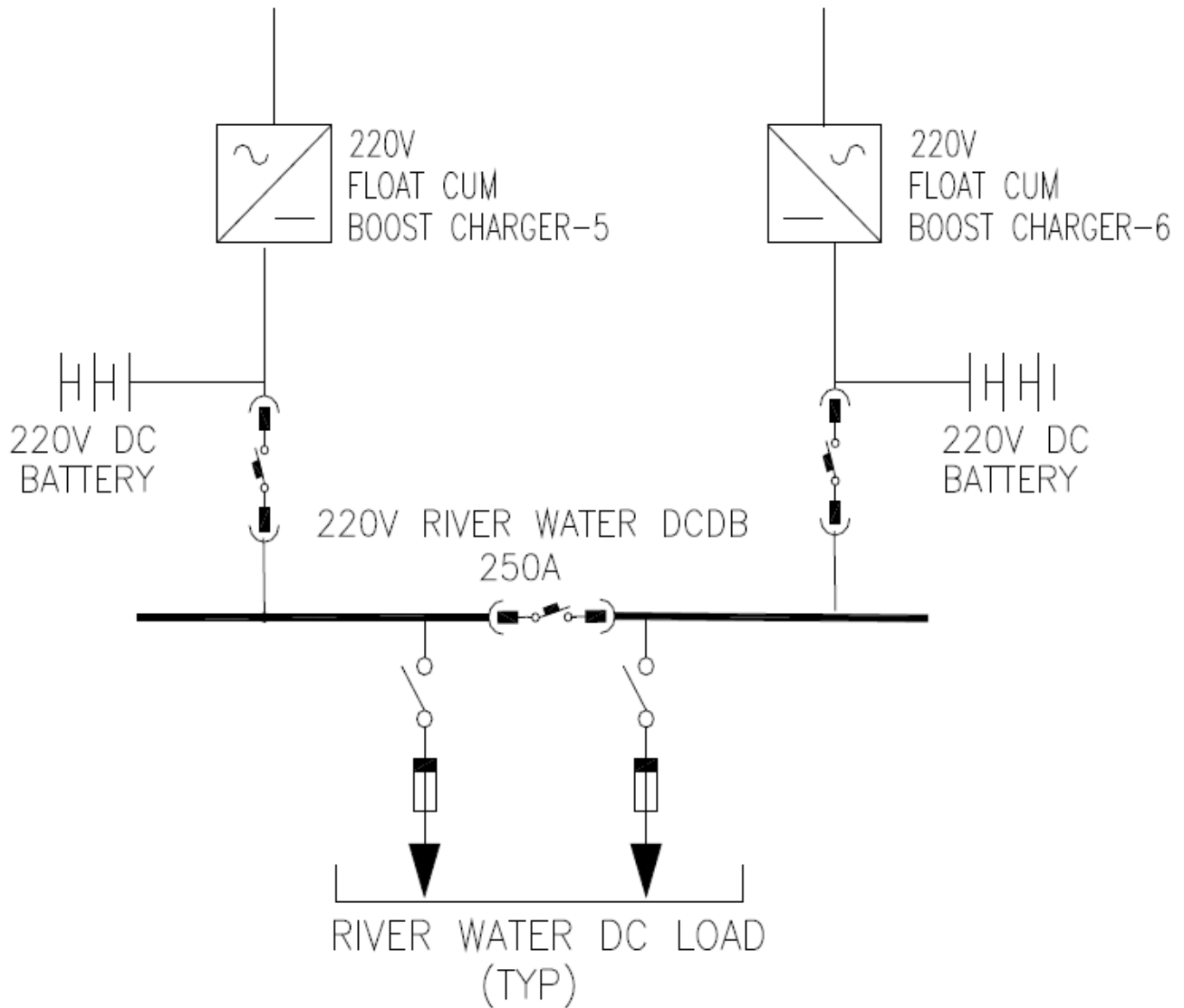
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ONE LINE DIAGRAM FOR 220 V RIVER WATER INTAKE DC SYSTEM





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ANNEXURE-D

DOCUMENTS/ DRAWINGS DISTRIBUTION SCHEDULE

S.NO.	DESCRIPTION	No. hard /soft copies	No. of CD-ROMs	REMARKS
1	Docs. /drgs. for approval (First submission)	PDF File	NIL	
2	Drgs. / docs. for approval (Second & subsequent submission till approval)	PDF File	NIL	
3	Final approval drgs. / docs. for Distribution after CAT-1.	PDF File + 5 Hard Copies	4 CD-ROMS	
4	As Built drgs./doc.	6 Hard Copies	4 CD-ROMS	
5	Operation, Erection & Maintenance manual for approval	PDF File	NIL	
6	Approved Operation & Maintenance Manual for distribution	PDF File + 6 Hard Copies	4 CD-ROMS	
7	Type Test Certificates/ Reports for approval	PDF	NIL	
8	Type Test Certificates/ Reports for distribution	6 hard Copies	4 CD-ROMS	



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ANNEXURE-E

LIST OF STANDARD DELIVERABLES FOR DC BATTERY CHARGER

SL. No.	DOCUMENT TITLE	DWG. / DOCUMENT No.	Submission Schedule
1	Data Sheet for Battery Charger	PE-VO-392-508-E101	Within two weeks of award of contract
2	General Arrangement drawing for Battery Charger	PE-VO-392-508-E102	Within two weeks of award of contract
3	Schematic/ Power Circuit diagram for Battery Charger	PE-VO-392-508-E103	Within two weeks of award of contract
4	Internal Layout drawing for Battery Charger	PE-VO-392-508-E104	Within two weeks of award of contract
5	Bill of Material for Battery Charger with list of makes	PE-VO-392-508-E105	Within two weeks of award of contract
6	Operation Write up for Battery charger	PE-VO-392-508-E106	Within two weeks of award of contract
7	Fault level Calculation for Battery Charger	PE-VO-392-508-E107	Within two weeks of award of contract
8	Calculation of Transformer kVA and Rectifier for Battery Charger	PE-VO-392-508-E108	Within two weeks of award of contract
9	Thyristor rating and fuse co-ordination calculation	PE-VO-392-508-E109	Within two weeks of award of contract
10	Filter Circuit Calculation for Battery charger	PE-VO-392-508-E110	Within two weeks of award of contract
11	AC Power consumption in float mode & boost mode	PE-VO-392-508-E111	Within two weeks of award of contract
12	List of E & C Spares for Battery Charger	PE-VO-392-508-E112	Within two weeks of award of contract
13	List of Mandatory Spares for Battery Charger	PE-VO-392-508-E113	Within two weeks of award of contract
14	O&M Manual for Battery Charger	PE-VO-392-508-E114	After despatch of Charger
15	Field Quality plan for Battery Charger	PE-VO-392-508-E115	Within two weeks of award of contract
16	Type test reports for the Battery Charger	PE-VO-392-508-E116	Within two weeks of award of contract
17	Circuit diagram and GA of battery discharge panel	PE-VO-392-508-E117	Within two weeks of award of contract
18	Circuit diagram and GA of battery fuse box	PE-VO-392-508-E118	Within two weeks of award of contract
19	Termination Arrangement At Battery Charger Terminals	PE-VO-392-508-E119	Within two weeks of award of contract
20	Quality Plan for Battery Charger	PE-QP-999-508-E003, REV. 0	Within two weeks of award of contract



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Sr. No.	PARAMETER	UNIT	VALUE
1.0	Power Supply & fault level details		
1.1	Rated AC voltage & variation	V, %	415 V, 3P-3W, $\pm 10\%$
1.2	Rated DC voltage & variation (Float Mode)	V, %	220 V, -15% to +10%
1.3	Rated DC voltage & variation (Boost Mode)	V, %	245-297V
1.4	Fault current of LV system (415 V)	kA	50 kA for <u>1 sec.</u>
1.5	Fault current of DC system limited upto (max)	kA	<u>20 Ka</u>
1.6	Battery Type	-	Lead Acid
BATTERY CHARGER			
2.0	Charger current rating		
2.1	Float-cum-boost charger1	A	520
2.2	Float-cum-boost charger2	A	320
2.3	Float-cum-boost charger3	A	80
3.0	Ripple content of charger		
3.1	Peak to peak	%	$\pm 1\%$
4.0	Degree of Protection (DOP)		
4.1	Rectifier transformer cubicle		IP-42
4.2	Control cubicle		IP-42
4.3	Discharge Resistor		IP-22
4.4	Battery Fuse Box		IP-42
5.0	Constructional features		
5.1	Panel sheet thickness/ material	mm	<u>2.0</u>
5.2	Paint shade (outside)		<u>631 of IS-5</u>
5.3	Paint shade (inside)		<u>631 of IS-5</u>
5.4	Cable gland plate thickness/ material	mm	<u>3 mm / Sheet steel/Al</u>
5.5	Gasket thickness/ material	mm	<u>3 mm / Rubber</u>
5.6	UNIT Battery Charger (520A)		
	a) Cable size from charger to DCDB		<u>3R-1CX300Sqmm (Cu)/ Pole</u>
	b) Cable size from battery to Charger through		<u>3R-1CX300Sqmm (Cu)/</u>



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	Battery Fuse Box		<u>Pole</u>
5.7	Station Battery Charger (320A)		
	a) Cable size from charger to DCDB		<u>1CX150Sqmm (Cu)/ Pole</u>
	b) Cable size from battery to DCDB through Battery Fuse Box		<u>1CX150Sqmm (Cu)/ Pole</u>
5.8	River Water Intake Battery Charger (80A)		
	a) Cable size from charger to DCDB		<u>1CX150Sqmm (Cu)/ Pole</u>
	b) Cable size from battery to Charger through Battery Fuse Box		<u>1CX150Sqmm (Cu)/ Pole</u>
6.0	Dropper diode for feeding loads while Charger is on Boost mode (Battery Intermediate cell tapping)	Yes/No	<u>No</u>

BATTERY FUSE BOX

7.0	Battery Fuse Box current rating	A	1000A (For Unit Battery Charger); 200A (For Station Battery Charger); 50A (For River Water Intake Battery Charger)
7.1	Fault current of DC system limited upto (max)	KA	<u>20 KA</u>
7.2	Panel sheet thickness/ material	mm	<u>2</u>
7.3	Paint shade (outside)		<u>631 of IS-5</u>
7.4	Paint shade (inside)		<u>631 of IS-5</u>
7.5	Cable gland plate thickness/ material	mm	<u>3 mm / Sheet steel/Al</u>
7.6	Gasket thickness/ material	mm	<u>3 mm / Rubber</u>

DISCHARGE RESISTOR

8.0	Discharge Resistor current rating	A	Suitable for battery size of 2860AH with 10Hour discharge rate (For Unit
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			Battery Charger); Suitable for battery size of 2100AH with 10Hour discharge rate (For Station Battery Charger); Suitable for battery size of 500AH with 10Hour discharge rate (For River Water Intake Battery Charger)
8.1	Duration of discharge	Hrs	10
8.2	Cooling of Discharge resistor		Fan cooled
8.3	Cable gland plate thickness/ material	mm	<u>3 mm / Sheet steel/Al</u>
8.4	Gasket thickness/ material	mm	<u>3 mm / Rubber</u>
METERS			
9.0	Accuracy		0.5 Accuracy class as per IS 1248
9.1	Size	mm ²	96X96
EARTHING			
10.0	Grounding terminal size/ no. for each charger		70X10 MM./ 2 nos.
10.1	Grounding terminal size/ no. for each fuse box		70X10 MM./ 2 nos.
10.2	Grounding terminal size/ no. for each discharge resistor		50X10 MM./ 2 nos.
11.0	Type Tests		
11.1	Validity period of type test reports		Within last five years
11.2	Type tests to be conducted for this contract, despite availability of valid & acceptable test certificates	Yes/ No	YES
11.3	Type test to be conducted		
11.3.1	Heat run test		YES
11.3.2	Temperature rise test to be conducted on Rectifier assembly at (%) of rated current	100 % / 200 %	NO
12.0	Mandatory Spares		



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12.1	Mandatory Spares to be quoted for this contract	Yes/ No	YES
12.2	If yes, list of mandatory spares		ATTACHED WITH ANNEXURE-A
13.0	E & C Spares		
13.1	E & C Spares to be quoted for this contract	Yes/ No	Yes
13.2	If yes, list of E & C Spares		Enclosed in annexure-A
14.0	Special tools & tackles		
14.1	Special tools & tackles to be quoted for this contract	Yes/ No	No
14.2	If yes, list of Special tools & tackles		
15.0	O & M SPARES		
15.1	O & M SPARES applicable for 3 years to be quoted for this contract	Yes/ No	Yes
15.2	If yes, list of O & M Spares		To be provided by Bidder



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



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



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

Lugs and Glands suitable for cable sizes per approved Data-Sheet.



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1.0 INTRODUCTION

This specification covers the design, manufacture, assembly, testing, packing and despatch of Battery charger (Float/Boost/Float cum Boost) complete in all respects with all components, fittings and accessories for efficient and trouble-free operation. The charger shall be connected either with Ni-Cd or Lead-acid type battery as applicable. In this specification though erection & commissioning is not included in vendor's scope, the vendor shall still not absolved of his responsibility of establishing the correctness of equipment at site.

2.0 CODES AND STANDARDS

The equipment shall generally conform to IS. Unless otherwise specified, the latest revisions of codes/ standards specified in Annexure-I enclosed are applicable.

3.0 OPERATIONAL REQUIREMENTS

- 3.1 Under normal conditions, when the AC supply is healthy at the battery charger input terminals, the float charger shall feed the continuous DC loads, while the boost charger shall remain off. Over and above the continuous DC loads the float charger shall also supply the necessary trickle charge to the battery, to keep the later in fully ready condition for being available during AC supply failure at charger terminals. Also some of the impulse loads of duration less than a minute for which the response of the charger is poor, shall be supplied by the associated battery in the DC system. This impulse discharge, shall, however, be continuously replenished by the float charger, unless the discharge is of considerable magnitude, in the event of which the boost charger shall be deployed.
- 3.2 The float charger shall withstand momentary supply failure due to changeover on AC supply feeding bus and continue to operate on float mode satisfactorily on restoration of AC supply to charger.
- 3.3 The DC system shall be ungrounded and shall float with respect to the ground potential when healthy. An earth fault relay of approved type and make shall be provided for detection and annunciation of earth fault.
- 3.4 After the batteries are boost charged and operation is changed to float mode, the voltage impressed on the loads shall not exceed float charge voltage.
- 3.5 The charger shall be designed to operate at an ambient air temperature of 50°C. It will be located indoor but in a hot, humid and tropical atmosphere.
- 3.6 The voltage at load terminal will not exceed the limits of +10% and -15% of nominal system voltage for DC system.

4.0 BATTERY CHARGERS

- 4.1 The battery chargers shall be self regulating, natural air cooled, static type/microprocessor based composed of silicon controlled rectifiers (SCRs)/IGBT connected in three phase full wave full control bridge circuit.
- 4.2 Each charger circuit shall be provided with its own AC input voltmeter with voltmeter selector switch, DC voltmeter & ammeter, battery DC output ammeter & voltmeter, battery charging current ammeter, control switches, rectifiers, Auto/ Manual voltage regulators, load limiting device, etc. as required for the successful operation of the DC system.
- 4.3 The charger shall have auto voltage regulators to enable stepless, smooth and continuous voltage control. The chargers shall have the effective current limiting feature and smoothing filters on both input and output to minimise harmonics, radio frequency transients, electromagnetic transients, etc.



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- 4.4 The battery chargers as well as their automatic regulators shall be of static type/ microprocessor based,. The battery chargers shall be capable of continuous operation at the respective rated load in float charging mode i.e. trickle charging the associated DC batteries while supplying the DC loads.
- 4.5 The battery chargers shall have a selector switch for selecting the battery-charging mode i.e. float or boost charging.
- 4.6 The battery chargers shall be provided with facility for both automatic and manual control of output voltage and current. The selector switch will select the mode of output voltage/current control, whether automatic or manual. Necessary provisions shall be provided to avoid current/voltage surges of harmful magnitude/nature, which may arise during changeover from auto to manual mode or vice versa under normal operating condition.
- 4.7 Soft start feature shall be provided to build up the voltage to the set value slowly within 15 seconds. The chargers shall have load limiters, which shall cause, when the voltage control is in automatic mode, a gradual lowering of the output voltage when the DC load current exceeds the load limiter setting of the charger. The load limiter characteristic shall be such that any sustained overload or short circuit in DC system shall not damage the charger nor shall it cause blowing of any of the charger fuses. The charger shall not trip on overload or external short circuit. After clearance of fault, the charger voltage shall build-up automatically when working in automatic mode.
- 4.8 When on automatic control mode during float charging, the charger output voltage shall remain within $\pm 1\%$ of the set value for AC input voltage variation of $\pm 10\%$, frequency variation of $+3\%$ to -5% , a combined voltage & frequency (absolute sum) variation of 10% and a continuous DC load variation from zero to full load. Uniform and stepless adjustment of voltage setting (in both auto/manual modes) shall be provided on the front of the charger panel covering the entire float charging output range specified. Stepless adjustment of the load limiter setting shall also be provided from 80% to 100% of the rated output current for float charging mode.
- 4.9 During boost charging, the battery chargers shall operate on constant current mode (when automatic regulator is in service). The boost charging current can be adjusted continuously over a range of 50% to 100% of the rated output current for boost charging mode. The charger output voltage shall automatically go on rising, when operating in boost mode, as the battery charges up. For limiting the output voltage of charger, a potentiometer shall be provided on the front of the panel, whereby it shall be possible to set the upper limit of this voltage anywhere in the output range specified for boost charging mode. All voltage and current setting potentiometers shall be vernier type/screw type.
- 4.10 Energising the charger with fully charged battery connected plus 10% load shall not result in output voltage greater than 110% of voltage setting. The time taken to stabilise within specified limits shall be less than 15 seconds.
- 4.11 Momentary output voltage of the Charger, without the Battery connected shall be within 94% to 106% of the voltage setting during sudden load Change from 100% to 20% of full load or vice-versa. Output voltage shall return to, and remain, within the limits specified as mentioned elsewhere in less than 2 seconds after the above mentioned change.
- 4.12 In case of float-cum-boost charger, manufacturer shall offer an arrangement in which the voltage setting device for float charging mode is also used as output voltage limit setting device for boost charging mode, and the load limiter of the float charging mode is also used as boost charging current setting device.
- 4.13 Suitable filter circuits shall be provided in all the chargers to limit the ripple content (peak to peak) in the output voltage to 1% , irrespective of the DC load fluctuation even when they are not connected to a battery.
- 4.14 The charger shall have provision for termination of two sets of 415V AC incoming supply cables. Both the sets of terminals shall be paralleled at the input side of the AC Isolating switch. Changeover arrangement between the AC supplies shall be provided by the BHEL at the upstream end.



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- 4.15 Ni-Cd Batteries shall be Trickle charged at 1.4 to 1.42 Volts per cell. Chargers shall be capable of boost charging the associated D.C. Battery at 1.53 to 1.7 Volts per cell in 8-10 hours.

Lead Acid Batteries shall be Trickle charged at 2.25 Volts per cell. Chargers shall also be capable of boost charging the associated D.C. Battery at 2.3 to 2.7 Volts per cell in 8-10 hours. The Chargers shall be designed to operate, as mentioned above, at an ambient air temperature of 50°C.

5.0 DESCRIPTION OF EQUIPMENT

5.1 Rectifier assembly

Rectifier assembly shall be full wave bridge type and designed to meet the duty as required by the respective charger. The rectifier cells shall be provided with their own heat dissipation arrangement with natural air-cooling. The rectifier shall utilise diodes / thyristors/IGBTs and heat sinks to carry 200% of the load current continuously and the temperature of the heat sink shall not be permitted to exceed 85°C absolute, duly considering the maximum charger panel inside temperature. Adequate snubber circuit shall be provided for the safety of thyristors, etc. The successful bidder shall furnish calculations to show what maximum junction temperature will be and what the heat sink temperature will be when operating at 200% and 100% load current continuously duly considering the maximum surrounding air temperature for these devices inside the charger panel at air ambient temperature of 50°C outside the panel. Necessary surge protection devices and rectifier type fast acting HRC fuses shall be provided in each arm of the rectifier connections.

5.2 Rectifier transformer and Chokes

The rectifier transformer & chokes shall be dry and air cooled (AN) type. The rating of the rectifier transformers & chokes shall correspond to the rating of the associated rectifier assembly and shall be copper wound. The rectifier transformers & chokes shall have class-F insulation with temperature rise limited to class-B insulation value. The rectifier transformer sizing shall be done considering all the loads connected to it. And, also a 10% design margin shall be considered on transformer sizing. The successful bidder shall furnish calculations for rectifier transformer sizing.

5.3 Blocking Diode

Blocking Diode shall be provided in the output circuit of each charger to prevent current flow from the DC battery into the charger. The successful bidder shall furnish calculations to show what maximum heat sink temperature will be when operating at 100% load current continuously duly considering the maximum surrounding air temperature for these devices inside the charger panel at air ambient temperature of 50°C outside the panel.

5.4 Voltage regulators

- 5.4.1 The float charger shall have both auto and manual voltage regulation arrangements. The voltage regulator shall have auto/manual option and be of static type. A selector switch for selection of the mode of voltage regulation shall be provided. AVR time constant shall not exceed 0.5.

- 5.4.2 The boost charger shall have auto/manual voltage regulation arrangement. The voltage adjustment shall be uniform and step less throughout the voltage variation range. The regulator shall be of static type. The boost charger shall be designed to charge the fully discharged battery to fully charged condition in 8 hrs.

5.5 Printed Circuit Boards (PCB)

PCB shall be made of glass epoxy of 1.6 mm thick, fire resistant, bonded with 99.8% pure copper foil, free of wrinkles, blisters, scratches and pinholes. The contact surface of the edge connectors of PCBs shall be plated with hard gold to a minimum thickness of 5 microns. The component identification shall be printed on PCB by Silk screen method. All PCBs shall be tropicalised and masked.



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5.6 Control and Selector Switches

The control and selector switches shall be of rotary stayput type with escutcheon plates showing functions and positions. The switches shall be of sturdy construction and suitable for mounting on panel front. The switches shall have shrouded live parts and sealed contacts against dust ingress. Auto/normal switch shall be of lockable type in either position. The contact ratings shall be at least the following:

- Make and carry continuously 10A
- Breaking current at 220V DC 0.5A (inductive)
- Breaking current at 240V AC 5.0A at 0.3 p.f.

5.7 Indicating Lamps

To indicate AC supply availability, three indicating lamps shall be provided. The indicating lamp shall be suitable for panel mounting, cluster type LED and capable of clear status indication under normal room illumination. The lamp covers shall be preferably screw type, unbreakable and moulded from heat resistant material.

5.8 Instruments

For all chargers, DC ammeter, DC voltmeter and AC voltmeter shall be provided in 96 x 96 mm² size with 0.5 accuracy class conforming to IS-1248. The instruments shall be flush mounted type, dust proof, moisture resistant and have easy accessible means for zero adjustment. Meters shall have **4 digit-7 segment LED/LCD display and RS 485 Serial Bus port**

5.9 Relays

The relays shall be enclosed in flush or semi flush dust tight cases finished with dull black enamel paint. Relays shall have self-contained test facilities and provisions for removing relay mechanism for inspection and maintenance.

5.10 Transducers

Transducers shall be panel-mounting type and suitable for operating temperatures from 0 to 55°C. Transducer output shall be used for remote display at DDCMIS. Transducers shall be provided in charger panel for DC battery voltage, charger output voltage and charger output current. The transducer shall have the following features:

- Input/ output with galvanic isolation
- Auxiliary voltage – 220V DC
- 4-20 mA independent dual output
- Accuracy class 0.5 or better
- Short circuit and over current protection

5.11 Contactors

All battery chargers shall have an AC contactor on the input side. It shall be of air break type and suitable for continuous duty. The operating coil shall be rated for 415 V/400V/380V. The DC contactors shall be single/double pole air break type and suitable for continuous duty.

5.12 Thermal overload relay

A thermal overload relay with single phasing protection (using differential movement of bimetal strips) shall also be provided for the AC input, which will trip the contactor.

5.13 Air break switches / MCCB

All chargers shall have AC input and DC output switches of air break, single throw, load break and fault make type or MCCB type. The contacts of the switches shall open and close with a snap action. The switches shall be rated for 120% of the maximum continuous load. The 'ON' and 'OFF' position of the switch shall be clearly indicated. The operating handle of the switches shall be fully insulated from circuit and shall be effectively earthed.



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5.14 Fuses

Fuses shall be of HRC cartridge fuse link type. Fuses shall be mounted on fuse carriers, which are mounted on fuse base. Wherever, it is not possible to mount fuses on fuse carriers, fuses shall be directly mounted on plug-in type bases. In such cases one insulated fuse pulling handle shall be supplied for each charger. Kick-off fuses (trip fuses) with alarm contacts shall be provided for all DC fuses. The fuses shall be suitable for applicable fault level.

5.15 Variable Metallic Resistor (Discharge Resistor)

~~One set of~~ Variable metallic resistors and shunt suitable for carrying out discharge tests (5 hour discharge rate for Ni-Cd battery and 10 hour discharge rate for Lead Acid battery) on the batteries shall be supplied. The Discharge resistor unit shall be of robust assembly consisting of Copper-Nickel Alloy wire grid elements. The Discharge Resistor fan shall be designed to allow rapid, forced cooling of resistor bank.

5.16 Battery fuse box / MCCB

Battery fuse / ~~MCCB~~ of adequate rating meeting the load duty cycle shall be supplied. Suppliers have to furnish DC fuse characteristics in support of the rating selected for the Battery Fuse Box. Battery fuse box / ~~MCCB~~ shall have suitable termination arrangement for terminating the incoming & outgoing cables informed during detailed engineering stage. Suitable cable lugs & glands have to be supplied with the equipment which shall be in Battery Charger Vendor scope.

5.17 Panel Construction

The charger panels housing all the equipment shall be indoor, floor mounting, air natural cooled, self-supporting sheet metal enclosed cubicle type. The charger panel and its frame shall be fabricated from 2.0 mm cold rolled sheet steel and have folded type construction. The bidder shall also supply necessary base frames, anchor bolts and hardware. Removable undrilled gland plates of at least 3.0 mm thick sheet steel and lugs for all cables shall be provided. The lugs for cables shall be made of electrolytic tinned copper. The gland plate shall be of adequate size for accommodating requisite number of cable glands for power and control cables. The charger shall be tropicalised and vermin proof. Ventilation louvers shall be backed with fine brass wire mesh. All door and covers shall be fitted with synthetic rubber/Neoprene gaskets. The panels shall have hinged double leaf doors provided on front and backside for adequate access of charger terminals. All the charger cubicle doors shall be properly earthed. The panels shall comply with at least degree of protection IP-42. Incoming and outgoing cables shall enter from bottom. Suitable cable terminal board with copper cable lugs and double compression brass nickel-plated cable glands shall be provided (which shall be in Battery Charger Vendor scope) in each panel for incoming and outgoing cables.

5.19 Electronic equipments shall be of modular design consisting of plug-in modules in standard 19 inches metallic racks with metallic card guides. The card should be provided with proper handles. Card to card wiring shall be through mother board. Unplanned jumpering and track modifications shall not be allowed. Mechanical interlocks to prevent wrong insertion of cards shall be provided. Each card shall have its junction and test points identified. Maintenance aids such as extension printed wiring boards and jumper leads shall be provided.

5.20 The layout of charger components shall be such that their heat losses do not give rise to excessive temperature within the charger panel surface. Location of the electronic modules will be such that temperature rise of the location, in no case, shall exceed 10°C over ambient air temperature outside the charger.

5.21 All the charger panels shall be provided with an illuminating lamp, a 5 Amp socket and space heaters with thermostat. Toggle switches and fuses shall be provided separately for each of the above fittings. Space heaters "ON" indication shall be provided. Two separate grounding pads shall be provided for each panel.

5.22 Locking facility

Locking facility shall be provided as follows:



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For locking float/boost selector switch in the float position only. This shall be used for having key mechanical interlock between float/boost selector switch and isolator in DCDB.

The charger enclosure door-locking requirement shall be met by the application of padlocks. Padlocking arrangement shall allow ready insertion of the padlock shackle but shall not permit excessive movement of the locked parts with the padlock in position.

5.23 Control wiring

Each panel shall be furnished completely factory wired upto power cable lugs and terminal blocks ready for external connections. The power wiring shall be carried out with 1.1kV grade, PVC insulated cables conforming to IS-1554 (Part-1). The control wiring shall be of 1.1kV grade, 1 core stranded copper wire with colour coded PVC insulation having identification ferrules at both terminal and device end for each wire. Wires shall conform to IS-694 and minimum size of the wire shall not be less than 2.5 mm². The control wiring terminating at electronic card shall not be less than 1.0 mm². The control terminal shall be suitable for connecting two wires with 2.5 mm² stranded copper conductors. All terminals shall be numbered for ease of connections and identification.

Power & control wiring within the panel shall be kept separate. Any terminal or metal work, which remains alive at greater than 415V, when panel door is opened, shall be fully protected by shrouding.

An air clearance of at least 10mm shall be maintained throughout all circuits, except low voltage electronic circuits, right upto the terminal lugs. Whenever this clearance is not available, the live parts shall be insulated or shrouded.

5.24 Terminal Blocks

Terminal blocks for all the chargers shall meet the following requirements:

- Terminal block shall be 1.1kV grade, minimum 10A rated, one piece moulded complete with insulating barrier, clip on type terminals, washers, nuts and identification strip etc. It shall be similar to Klippon type RSF with insulating material of melamine or equivalent. Marking on terminal strips shall correspond to the terminal numbering on wiring diagrams. Terminal blocks for CT & VT secondary leads shall be provided with links to facilitate testing, isolation, star/delta and earthing. Terminal blocks for CT secondary shall have the short-circuiting facility.
- At least 20% spare terminals for external connections shall be provided on each panel and these spare terminals shall be uniformly distributed on all terminal blocks.
- There shall be minimum clearance of 250mm between the terminal blocks and the cable gland plate and 150mm between two rows of terminal blocks.

5.25 Cable Lugs

Heavy duty bolt-on termination tinned copper lugs of compression type shall be used in the Charger for power cable termination. The supply of tinned copper cable lugs for power cables forms part of the supply of equipment. Cable lugs shall comply with IS-8309.

5.26 Cable Glands

The supply of cable glands forms part of the supply of equipment. Cable glands shall conform to BS-6121. Cable glands shall be of double compression type.

5.27 Panel Earthing

Charger panels shall have fully rated GI ground bus with two ground terminals, one at each end of the panel. Each ground terminal shall have two bolt drillings with GI bolts and nuts suitable for connection to purchaser's ground conductor.



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6.0 ANNUNCIATION SYSTEM

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

- a) AC supply failure
- b) AC input fuse failure (separate for FCBC/Float/Boost)
- c) AC Undervoltage/Overvoltage
- d) Rectifier fuse failure
- e) Charger failure
- f) Surge circuit fuse failure
- g) Filter fuse failure
- h) Blocking Diode failure
- i) Load limiter operated
- j) Charger trip/over loaded
- k) Battery on boost
- l) DC system earth fault
- m) DC Voltage Low/High
- n) Battery fuse blown
- o) Boost Bus Overvoltage
- p) DC system under voltage/over voltage

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

- q) Battery fuse fails
- r) Battery on boost
- s) Charger over load
- t) Charger trouble (this being a group alarm initiated by any of the faults of charger other than charger over load).

6.2 Suitable potential free contacts for remote indication of above abnormal conditions shall be provided. Multiplication relays, if required, shall be included in the panel. Indications for charger input supply healthy, charger in FLOAT mode and charger in BOOST mode shall be provided.

7.0 NAME PLATE AND MARKING

The name plates shall be made of non-rusting metal / 3 ply Lamicaid and shall have black back ground with white engraved letters and secured by screws. These shall be provided near top edge on the front as well as on rear side of charger. Name plates with full and clear inscriptions shall also be provided on and inside the panels for identification of the various equipments.

8.0 PAINTING

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



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9.0 PERFORMANCE GUARANTEE

The bidder shall guarantee that chargers offered shall meet the ratings and performance requirements stipulated for various equipments covered in this specification. If the equipment fails to meet the requirement, the supplier shall replace it with appropriate equipment free of cost without affecting the schedule.

10.0 INSPECTION & TESTING

10.1 The bidder shall confirm compliance to Quality plan enclosed with Section-C of specification. The Quality plan shall be subject to BHEL/ customer approval after award of contract without any commercial or delivery implication. Inspection shall be carried out as per BHEL/ customer approved Quality plan.

10.2 All equipments to be supplied shall be of type-tested quality. The bidder shall furnish all type test reports for BHEL/ customer approval. The Type tests should have been carried out within last five years on the equipment similar to those proposed to be supplied under this contract and the tests should have been either conducted at an independent laboratory or should have been witnessed by a client/ government agency. In absence of such type tests reports or in case such reports are not found to be meeting the specification/ standards requirements, vendor shall conduct all such type tests without any commercial/ delivery implication to BHEL according to the relevant standards and reports shall be submitted to the owner for approval. (Type test charges as per clause 10.10 shall not be applicable in such cases).

10.3 The details of Type Tests to be conducted shall be as per Data Sheet-A attachment-I enclosed with Section-C of specification.

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

- i) Temperature rise test at full load
- ii) Temperature rise test for rectifier assembly at current specified in Data Sheet-A Section-C.
- iii) Insulation resistance test
- iv) High voltage (power frequency) test on power & control circuits except low voltage electronic circuit
- v) Ripple content test at no load, half and full load
- vi) Automatic voltage regulation operation test at specified AC supply variations at no load, half and full load
- vii) Load limiter operation test.
- viii) Efficiency and power factor measurement.
- ix) Input and output surge withstand capacity test. Surge voltage as per ANSI-C37.90a shall be applied for a period of not less than 2 seconds at the following points of the charger operating at 50°C at full load:
 - a) Across each AC input phases
 - b) Across AC input line to ground
 - c) Across DC output terminals
 - d) Across each DC output terminal to ground



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The charger shall not exhibit any component damage and there shall be no deterioration in performance of the charger.

x) Environmental Tests: Steady state performance tests (temperature rise test at full load & load limiter operation test) shall be carried out before & after the following tests.

a) Soak test: The electronic modules shall be subject to continuous operation for a minimum period of 72 hours. During last 48 hours, the ambient temperature shall be maintained at 50°C. The 48 hour test period shall be divided into 4 equal 12 hour segments. The input voltage during each 12 hours shall be nominal voltage for 11 hours followed by 110% of nominal voltage for 30 minutes, followed by 90% of nominal voltage for 30 minutes.

b) Degree of protection test

xi) Complete physical examination

xii) Dynamic response test

Overshoot / undershoot in output voltage of the charger corresponding to sudden change in load from 100% to 20% and from 20% to 100%.

10.5 Rectifier transformers shall be subjected to following routine test as per IS: 11171:

a) Voltage Ratio Test

b) DC resistance Test

c) No Load Test Measurement of iron losses

d) Measurement of Tap Voltages

e) Measurement of Cu. Losses

f) High voltage test

g) Induced high voltage test

h) Heat run Test

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

i) Complete physical examination.

ii) Temperature rise test on complete charger at full load.

iii) Insulation resistance test.

iv) High voltage (power frequency) test.

v) Ripple content test at no load, half and full load.

vi) AVR operation test at specified AC supply variation at no load, half and full load.



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- vii) Load limiter operation test.
- viii) Checking of proper operation of annunciation system.
- ix) Dynamic response test
Overshoot / undershoot in output voltage of the charger corresponding to sudden change in load from 100% to 20% and from 20% to 100%.
- x) Burn in test shall be carried out on all electronic modules or panels with modules. During the test the panel / module shall be subjected to ambient temperature of 50°C for 48 hours in energised condition. The temperature rise inside the cubicle shall not exceed 10°C during the test.
- xi) Degree of protection test
The charger shall be checked for gasket arrangement as per the drawings.
- xii) Efficiency and power factor measurement.
- 10.7 Following routine tests shall be carried out on annunciation system:
- i) Annunciation assembly and module shall be functionally tested as per EEUA-45D.
- ii) Burn in test as specified above in cl. No. 10.5 (x) above.
- 10.8 All material used for the construction of the equipment / items shall be new and shall be in accordance with the requirements of this specification. Materials utilised shall be those, which have established themselves for use in such applications.
- 10.9 All acceptance and routine tests as per relevant standards and specification, shall be carried out by the manufacturer. Charges for all these routine and acceptance tests for all the materials shall be deemed to be included in the bid price.
- 10.10 The bidder shall indicate cost of carrying out all the Type tests as specified in the specification. The charges for each of the Type tests shall be given separately in price schedule (Volume III) as optional. These prices will be applicable in case a type test is required to be conducted by purchaser despite availability of satisfactory type test report as per clause 10.2 above.
- 11.0 DOCUMENTATION
- 11.1 Documents to be submitted by the Bidder along with the bid:
- 1) Clause wise deviation if any in the enclosed format.
 - 2) ~~Out line drawings of charger, battery fuse box.~~
 - 3) Unpriced Price Schedule (Annexure-A as enclosed with the specification) with bidder's signature and company stamp.
 - 4) A copy of the sheet "Instructions to Bidders for Preparing Technical Offer" with bidder's signature and company stamp.
 - 5) A copy of sheet "List Of Contents" with bidder's signature and company stamp.



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11.2 Over and above the documents mentioned in 11.1, the following documents are to be submitted after the award of the contract for purchaser's approval:

- 1) Brief write-up on the working of the system offered along with Installation, operation and maintenance manual for the battery charger, battery fuse and variable metallic resistor and shunt.
- 2) Data sheet-C
- 3) General arrangement drawing showing the battery charger and associated components, Fuse Box & discharge resistor.
- 4) Wiring diagram.
- 5) Quality plan.
- 6) Transformers KVA and voltage rating calculation.
- 7) ~~Fault current calculation.~~
- 8) Thyristor rating, heat sink and fuse co-ordination calculation.
- 9) Blocking Diode rating & heat sink calculation.
- 10) Filter circuit calculation.
- 11) AC power consumption in float mode & boost mode.
- 12) List of make of major components.
- 13) Test certificates as required/ type test procedures
- 14) ~~Installation, operation and maintenance manual for the battery charger, battery fuse and variable metallic resistor and shunt.~~
- 15) ~~Descriptive pamphlets, giving all information regarding the various components/equipments.~~
- 16) ~~Other relevant documents and data necessary for approval of drawings under this clause and for satisfactory operation and maintenance.~~
- 17) Field quality plan. Bidder shall furnish field quality plan detailing out the specific quality control procedure covering receipt of material/equipment and handling at site, storage, erection, commissioning, post commissioning etc.
- 18) LIST OF E&C SPARES
- 19) LIST OF MANDATORY SPARES

11.3 Instruction Manuals

Instruction manuals for the installation, operation and maintenance of battery charger, battery fuse and variable metallic resistor and shunt to be supplied at least two months before the date of despatch of equipment.

The installation and maintenance manual of battery charger, battery fuse and variable metallic resistor and shunt shall contain the following.



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- A) General description giving type and rating of equipment.
- B) Technical data.
- C) Salient constructional details.
- D) Instruction to be followed on receipt at site.
- E) Erection procedures and checks (handling at site, erection, pre-commissioning).
- F) Commissioning procedures and site tests.
- G) Routine, periodic and preventive inspection and maintenance procedures.
- H) Safety rules.
- J) Possible faults, their causes and remedies.
- K) Catalogues, literature and drawings.
- L) Outline dimension drawings showing constructional features, relevant cross sectional views and earthing details, operator oriented description of equipment and accessories.
- M) Operating procedures, maintenance procedures & precautions to be taken during operation and maintenance work.

12.0 SPARES

- 12.1 Bidder to furnish the E & C spares as per attachment-III Data Sheet-A enclosed with Section-C of specification.
- 12.2 Bidder to quote O&M spares for 3 years of normal operation as optional items.

13.0 TOOLS AND TACKLE

Tools & tackle, which are essential to facilitate assembly, adjustments, maintenance & dismantling of equipment shall be provided as part of equipment supplied. The above tools shall be supplied along with the initial consignment of equipment so as to be available prior to erection but may not be used for erection purposes.

14.0 AS-BUILT DRAWINGS

Though only supply of equipment is under bidder's scope, bidder may note that all as-built correction (as given by purchaser to vendor) shall have to be incorporated in the originals by the vendor and copies of the as-built corrected drawings / documents as per requirement shall be submitted by the vendor.

15.0 STATUTORY AND REGULATORY REQUIREMENTS

Statutory and regulatory requirements as per IE rule 1956 with amendment-3 rule 1986, rules Nos. 35, 42, 50 & 51 shall be adhered to.



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ANNEXURE-I


LIST OF APPLICABLE STANDARDS


- | | | |
|-----|--|-----------------|
| 1. | GUIDE FOR SURGE WITHSTAND CAPABILITY TESTS | ANSI-C 37.90a |
| 2. | COLOURS FOR READY MIX PAINTS | IS-5 |
| 3. | PVC INSULATED CABLE FOR WORKING VOLTAGE 1100V | IS-694 |
| 4. | INDICATING ANALOGUE ELECTRICAL MEASURING INSTRUMENTS | IS-1248 |
| 5. | DOP FOR LV SWITCHGEAR AND CONTROL GEAR | IS-13947 PART-1 |
| 6. | SPECIFICATION FOR LV SWITCHGEAR AND CONTROL GEAR | IS-13947 |
| 7. | ELECTRICAL RELAYS FOR POWER SYSTEM PROTECTION | IS-3231 |
| 8. | APPLICATION GUIDE FOR ELECTRICAL RELAYS FOR AC SYSTEM | IS-3842 |
| 9. | MONO CRYSTALLINE SEMICONDUCTOR RECTIFIER CELLS & STACKS | IS-3895 |
| 10. | MONO CRYSTALLINE SEMICONDUCTOR RECTIFIER ASSEMBLIES & EQUIPMENT | IS-4540 |
| 11. | CODE OF PRACTICE FOR PHOSPHATING OF IRON & STEEL | IS-6005 |
| 12. | SAFETY CODE FOR SEMICONDUCTOR RECTIFIER EQUIPMENT | IS-6619 |
| 13. | CONTROL SWITCHES (SWITCHING DEVICES FOR CONTROL AND AUXILIARY CIRCUITS INCLUDING CONTACTOR RELAYS) FOR VOLTAGE UPTO 1000V AC OR 1200V DC | IS-6875 |
| 14. | ENVIRONMENTAL TESTING FOR ELECTRONIC & ELECTRICAL ITEMS | IS-9000 |
| 15. | LV FUSE FOR VOLTAGES BELOW 1000V AC OR 1500V DC | IS-13703 |
| 16. | PERFORMANCE REQUIREMENT FOR ALARM ANNUNCIATION SYSTEM | EEUA-45D |
| 17. | POWER TRANSFORMERS | IS-2026 |
| 18. | INDIAN ELECTRICITY RULES & INDIAN ELECTRICITY ACTS | |


NOTE: Equipment complying to other internationally accepted standards such as IEC, BS, VDE etc. will also be considered if they ensure performance and constructional features equivalent or superior to standards listed above. In such a case, the bidder shall clearly indicate the standards adopted, furnish a copy in English of the latest revision of the standards alongwith copy of all official amendments and revisions and shall clearly bring out the salient features for comparison.


		QUALITY PLAN		CUSTOMER: RAJASTHAN RAJYA VIDYU		PROJECT TITLE : 2X660 MW SURATGARH STPP		SPECIFICATION NO. : PE-TS-392-508-E002				
				UTPADAN NIGAM LIMITED				SPECIFICATION TITLE:TECHNICAL SPECIFICATION				
				BIDDER/ :		STANDARD QP NO. : PE-QP-999-508-E003, REV. 0		FOR 220V DC BATTERY CHARGER				
SHEET 1 OF 6		VENDOR		SYSTEM 220V DC SYSTEM		ITEM : BATTERY CHARGER		DOC. NO. :				
SL. NO.	COMPONENT/OPERATION	CHARACTERISTIC CHECK	CAT.	TYPE/METHOD OF CHECK	EXTENT OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORM	FORMAT OF RECORD	AGENCY			REMARKS
									P	W	V	
1	2	3	4	5	6	7	8	9	10			11
1.0 RAW MATERIAL												
1.1	M.S Sheet (CRCA)	1. Grade	Major	Visual	100%	MFR's drg	MFR's drg	IR	3	-	1	IR=INSPECTION RECORD
		2. Thickness & Finish	Major	Physical	Sample/lot	BHEL appd drg/data sheet	BHEL appd drg/data sheet	-do-	3	-	1	
1.2	Powder Paint	Shade	Major	Visual	Sample/lot	IS-5(1994) SHADE CARD	BHEL appd drg/data sheet	-do-	3	-	1	
2.0 Major bought out items												
2.1	Power Switches,MCCB, Timer, Contactor & Relay	1) Type, Rating	Major	Physical	100%	BHEL appd drg/data sheet	BHEL appd drg/data sheet	IR	3	-	2,1	**
		2) Mechanical Operation/functional check	Major	Visual	100%	MFR's std.	MFR's std.	-do-	3	-	-	
2.2	MCB, Push Buttons,HRC fuse,terminal blocks,control & selector switches,Semiconductor Fuses,Heaters,Thermostat,Lamps, Plug in socket	1) Type, Rating	Major	Visual	100%	BHEL appd drg/data sheet	BHEL appd drg/data sheet	COC	3	-	2,1	
		2)Continuity test	Major	Electrical	100%	MFR's std.	MFR's std.	-do-	3	-	2,1	
2.3	Rectifier bridge Element	1) Type, Rating	Major	Visual	100%	BHEL appd drg/data sheet	BHEL appd drg/data sheet	IR	3	-	2,1	**
2.4	Digital Multi Function Meters	1) Type, Rating	Major	Visual	100%	BHEL appd drg/data sheet	BHEL appd drg/data sheet	IR	3	-	2,1	
		2) Calibration Certificate	Major	Visual	100%	-do-	-do-	MFT TC	-	-	3,2,1	
		3) Routine TC	Major	Electrical	100%	-do-	-do-	-do-	-	-	3,2,1	
2.5	PVC Insulated Electric Cable	1) Type, size	Major	Visual	100%	BHEL appd data sheet	BHEL appd data sheet	COC	3	-	2,1	** , All power cables to conform to IS 1554;Control wires to conform to IS 694
		2) I.R Test	Major	Electrical	Sample/lot	-do-	-do-	COC	3	-	2,1	
		3) H.V Test	Major	Electrical	Sample/lot	-do-	-do-	COC	3	-	2,1	
2.6	Transducer	1) Routine TC & calibration report	Major	Electrical	100%	IS 12784	IS 12784	Mfr TC	3	-	2,1	
		2) Type, Rating	Major	Visual	100%	-do-	-do-	-do-	3	-	2,1	
2.7	Current Transformer,Voltage Transformer, Dimmerstat Control Transformer	1) Routine Tests	Major	Electrical	100%	BHEL appd drg/Data sheet/ IS 2705	BHEL appd drg/Data sheet/ IS 2705	Mfr TC	3	-	2,1	
		1) Type, Rating	Major	Visual	100%	-do-	-do-	IR	3	-	2,1	**
BHEL			PARTICULARS		BIDDER/VENDOR							
			NAME									
			SIGNATURE									
			DATE					BIDDER'S/VENDOR'S COMPANY SEAL				
LEGEND : 1 - BHEL/ CUSTOMER 2 - VENDOR 3 - SUB- VENDOR P - PERFORM W - WITNESS V - VERIFICATION												

		QUALITY PLAN		CUSTOMER: RAJASTHAN RAJYA VIDYUT		PROJECT TITLE : 2X660 MW SURATGARH STPP		SPECIFICATION NO. : PE-TS-392-508-E002				
				UTPADAN NIGAM LIMITED		STANDARD QP NO. : PE-QP-999-508-E003, REV. 0		SPECIFICATION TITLE: TECHNICAL SPECIFICATION				
SHEET 2 OF 6				SYSTEM 220V DC SYSTEM		ITEM : BATTERY CHARGER		DOC. NO. :				
SL. NO.	COMPONENT/OPERATION	CHARACTERISTIC CHECK	CAT.	TYPE/METHOD OF CHECK	EXTENT OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORM	FORMAT OF RECORD	AGENCY			REMARKS
									P	W	V	
1	2	3	4	5	6	7	8	9	10			11
2.8	Busbar	1) Dimensional checkup	Major	Physical	100%	BHEL appd drg/data sheet	BHEL appd drg/data sheet	IR	3	-	2,1	
		2) Conductivity test	Major	Electrical	Sample/lot	-do-	-do-	IR	3	-	2,1	
		3) Surface Finish	Major	Visual	100%	-do-	-do-	IR	2	-	1	
		4) Material Grade	Major	Verif. of TC	1/Lot	-do-	-do-	Mfr TC	2	-	1	
2.9	Annunciation facia (if applicable)	All routine test as per EEUA-45D	Major	Electrical	100%	BHEL appd GA drg	BHEL appd GA drg	Mfr TC	3	-	2,1	
2.10	Visual Indications for charger status using LED/indicating lamps (if annunciation facia is not used)	Electronic card used for indication (refer Electronic card assembly & location at cl. No.3.4,for checks				BHEL appd GA drg	BHEL appd GA drg		2	-	1	
2.11	Rectifier Transformer	1) Rating	Major	Visual	100%	BHEL appd Data sheet	BHEL appd Data sheet	IR	3	-	2,1	
		2) Dimensional check	Major	Physical	100%	MFR's drg.	MFR's drg.	-do-	3	-	2,1	
		a) Overall size	Major	Physical	100%	-do-	-do-	-do-	3	-	2,1	
		b) Mounting Details	Major	Physical	100%	-do-	-do-	-do-	3	-	2,1	
		3) Terminal Board	Major	Physical	100%	-do-	-do-	-do-	3	-	2,1	
		4) Polarity Test	Major	Electrical	100%	-do-	-do-	-do-	3	-	2,1	
		5) I.R Test	Major	Electrical	100%	-do-	-do-	-do-	3	-	2,1	
		6) Routine Tests										
		a) Voltage Ratio Test	Major	Electrical	100%	IEC 146	IEC 146	IR/ Mfr Tc	3	-	2,1	
		b) DC resistance Test	Major	Electrical	100%	-do-	-do-	-do-	3	-	2,1	
		c) No Load Test	Major	Electrical	100%	-do-	-do-	-do-	3	-	2,1	
		d) Measurement of iron losses	Major	Electrical	100%	-do-	-do-	-do-	3	-	2,1	
		e) Measurement of Cu. Losses	Major	Electrical	100%	-do-	-do-	-do-	3	-	2,1	
		f) High voltage test	Major	Electrical	100%	-do-	-do-	-do-	3	-	2,1	
		g) Induced high voltage test	Major	Electrical	100%	-do-	-do-	-do-	3	-	2,1	
		h) Heat run Test	Major	Electrical	100%	-do-	-do-	-do-	3	-	2,1	Temp. rise limited to class A insulation value
2.12	Choke	1) Rating	Major	Physical	100%	BHEL appd Data sheet	BHEL appd Data sheet	IR				
		2) Dimensional check	Major	Physical	100%	MFR's drg.	MFR's drg.	-do-				
		a) Overall size			100%	-do-	-do-	-do-				
		b) Mounting Details			100%	-do-	-do-	-do-				
BHEL			PARTICULARS		BIDDER/VENDOR							
			NAME									
			SIGNATURE									
			DATE					BIDDER'S/VENDOR'S COMPANY SEAL				
LEGEND : 1 - BHEL/ CUSTOMER 2 - VENDOR 3 - SUB- VENDOR P - PERFORM W - WITNESS V - VERIFICATION												

		QUALITY PLAN		CUSTOMER: RAJASTHAN RAJYA VIDYUT		PROJECT TITLE : 2X660 MW SURATGARH STPP			SPECIFICATION NO. : PE-TS-392-508-E002			
				UTPADAN NIGAM LIMITED								
				BIDDER/ : VENDOR		STANDARD QP NO. : PE-QP-999-508-E003, REV. 0			SPECIFICATION TITLE:TECHNICAL SPECIFICATION DOC. NO. :			
SHEET 3 OF 6		SYSTEM		220V DC SYSTEM		ITEM : BATTERY CHARGER						
SL. NO.	COMPONENT/OPERATION	CHARACTERISTIC CHECK	CAT.	TYPE/METHOD OF CHECK	EXTENT OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORM	FORMAT OF RECORD	AGENCY			REMARKS
									P	W	V	
1	2	3	4	5	6	7	8	9	10			11
		3) Terminal Board/Bakelite plate or busbar	Major	Physical	100%	-do-	-do-	-do-	3	-	2,1	
		4) Terminal rating	Major	Physical	100%	-do-	-do-	-do-	3	-	2,1	
		5) Air gap Measurement	Major	Physical	100%	-do-	-do-	-do-	3	-	2,1	
		6) Contuinity test	Major	Electrical	100%	-do-	-do-	-do-	3	-	2,1	
		7) Insulation Resistance	Major	Electrical	100%	IEC 146	IEC 146	IR/ Mfr TC	3	-	2,1	
		8) High voltage test	Major	Electrical	100%	-do-	-do-	-do-	3	-	2,1	
		9) DC resistance Test	Major	Electrical	100%	-do-	-do-	-do-	3	-	2,1	
		10) Heat run Test	Major	Electrical	100%	-do-	-do-	-do-	3	-	2,1	Temp. rise limited to class A insulation value
2.13	Printed Circuit Boards Insulating Materials (FRP,SMC,DMC,ETC.)	1. Electrical	CR	Elect. Test	Sample	Relevant IS, MFR's Std.	Relevant IS, MFR's Std.	Test Certificate	2	-	1	
		2. Mech Props.	MA	Mech Test	Sample	-do-	-do-	-do-	2	-	1	
		3. Tracking Index	MA	Elect. Test	Sample	-do-	-do-	-do-	3/2	-	1	
	Paints	Shelf Life	MA	Visual	100%as per Paints Manuf's. Spec.....		IR	2	-	-	
	Gaskets(Syn. Rubber only)	1. Dimension	MA	Measurement	Sample	MFR's DRGS.	MFR's DRGS.	IR	2	-	-	
		2. Shore Hardness	MA	Test	-do-	MFR's DRGS.	MFR's DRGS.	IR	2	-	-	
		3. Ageing	MA	Test	-do-	IS-3400/BS-2752	IS-3400/BS-2752	INSPN Report	2	-	-	
3.0	In process Inspection											
3.1	Enclosure fabrication	1) Dimensional checks	Major	Physical	100%	MFR's Fabrication drg	MFR's Fabrication drg	IPIR	2	-	1	IPIR= In process Inspection Report
		2) Diagonal (Skewness)	Major	Physical	-do-	-do-	-do-	-do-	2	-	1	
		3) Straightness	Major	Physical	-do-	-do-	-do-	-do-	2	-	1	
		4) Welded joints	Major	Visual	-do-	-do-	-do-	-do-	2	-	1	
		5) Deburring & Finishing of welded joints	Major	Visual	-do-	-do-	-do-	-do-	2	-	1	
BHEL		PARTICULARS		BIDDER/VENDOR								
		NAME										
		SIGNATURE										
		DATE						BIDDER'S/VENDOR'S COMPANY SEAL				
LEGEND : 1 - BHEL/ CUSTOMER 2 - VENDOR 3 - SUB- VENDOR P - PERFORM W - WITNESS V - VERIFICATION												

		QUALITY PLAN		CUSTOMER: RAJASTHAN RAJYA VIDYU		PROJECT TITLE : 2X660 MW SURATGARH STPP		SPECIFICATION NO. : PE-TS-392-508-E002				
				UTPADAN NIGAM LIMITED								
				BIDDER/ VENDOR :		STANDARD QP NO. : PE-QP-999-508-E003, REV. 0		SPECIFICATION TITLE: TECHNICAL SPECIFICATION		DOC. NO. :		
SHEET 4 OF 6		SYSTEM		220V DC SYSTEM		ITEM : BATTERY CHARGER						
SL. NO.	COMPONENT/OPERATION	CHARACTERISTIC CHECK	CAT.	TYPE/ METHOD OF CHECK	EXTENT OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORM	FORMAT OF RECORD	AGENCY			REMARKS
									P	W	V	
1	2	3	4	5	6	7	8	9	10			11
3.2	Pre treatment of enclosure	1) Dimensional checks	Major	Physical	100%	IS 6005 / MFR's Std practice	IS 6005 / MFR's Std practice	IPIR	2	-	1	
		2) Water rinsing	Major	Physical	-do-	-do-	-do-	-do-	2	-	1	
		3) Derusting	Major	Physical	-do-	-do-	-do-	-do-	2	-	1	
		4) Water rinsing			-do-				2	-	1	
		5) Phosphating	Major	Physical	-do-	-do-	-do-	-do-	2	-	1	
		6) Water rinsing	Major	Physical	-do-	-do-	-do-	-do-	2	-	1	
		7) Hot- Chromating	Major	Physical	-do-	-do-	-do-	-do-	2	-	1	
		8) Sealing (If used)							2	-	1	
3.3	Powder Coating	1) Shade, Thickness & Finish	Major	Cross Hatch	Random	IS 6005 / MFR's Std practice	IS 6005 / MFR's Std practice	-do-	2	-	1	
		2) Adhesion check by cross hatch method	Major	Visual	100%	-do-	-do-	-do-	2	-	1	
3.4	Electronic card assembly & location	1) Electronic cards fittings	Major	Cross Hatch	Random	Electronic cards shall be modular fitted in standard 19" metal racks with guides	Electronic cards shall be modular fitted in standard 19" metal racks with guides	-do-	2	-	1	
		2) Mechanical interlock	Major	Visual	100%	To avoid wrong insertion of cards	No wrong insertion of cards possible	-do-	2	-	1	
		3) Correctness of electronic components	Major	Visual	100%	MFR's drg	MFR's drg	-do-	2	-	1	
		4) Jumpers/ track modification	Major	Visual	100%	No unplanned jumpers / track modification	No unplanned jumpers / track modification	-do-	2	-	1	
		5) Finish of electronic cards	Major	Visual	100%	MFR's drg	No dry soldering	-do-	2	-	1	
		6) Environmental check on cards to remove cards with infant mortal components	Major	Visual	100%	MFR's std	MFR's std	-do-	2	-	1	
3.5	Assembly of components & modules	1) Transformer & choke	Major	Visual	100%	MFR's drg	MFR's drg	-do-	2	-	1	
		2) Mounting of components such as switches, rectifiers, stack fuses, meter & contactor	Major	Visual	100%	-do-	-do-	-do-	2	-	1	
		3) Minimum clearance between busbar	Major	Physical	100%	Relevant IS	Relevant IS	-do-	2	-	1	
		4) Electronic cards location inside the panels	Major	Visual	100%	Approved drg.	Temp. rise of the location should not exceed 10°C over ambient during heat run test	-do-	2	-	1	
BHEL			PARTICULARS			BIDDER/VENDOR						
			NAME									
			SIGNATURE									
			DATE						BIDDER'S/VENDOR'S COMPANY SEAL			
LEGEND : 1 - BHEL/ CUSTOMER 2 - VENDOR 3 - SUB- VENDOR P - PERFORM W - WITNESS V - VERIFICATION												

		QUALITY PLAN		CUSTOMER: RAJASTHAN RAJYA VIDYU UTPADAN NIGAM LIMITED		PROJECT TITLE : 2X660 MW SURATGARH STPP			SPECIFICATION NO. : PE-TS-392-508-E002			
				BIDDER/ : VENDOR		STANDARD QP NO. : PE-QP-999-508-E003, REV. 0			SPECIFICATION TITLE: TECHNICAL SPECIFICATION FOR 220V DC BATTERY CHARGER			
		SHEET 5 OF 6		SYSTEM 220V DC SYSTEM		ITEM : BATTERY CHARGER						
SL. NO.	COMPONENT/OPERATION	CHARACTERISTIC CHECK	CAT.	TYPE/METHOD OF CHECK	EXTENT OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORM	FORMAT OF RECORD	AGENCY			REMARKS
									P	W	V	
3.6	Wiring	1. Bunching	Major	Visual	100%	MFR's drg	MFR's drg	IPIR	2	-	1	
		2. Marking	Major	Visual	100%	-do-	-do-	-do-	2	-	1	
		3. Ferruling	Major	Visual	100%	-do-	-do-	-do-	2	-	1	
		4. Lugs crimping	Major	Physical	100%	-do-	-do-	-do-	2	-	1	
		5. Continuity	Major	Electrical	100%	-do-	-do-	-do-	2	-	1	
		6. Identification labels	Major	Visual	100%	-do-	-do-	-do-	2	-	1	
3.7	Finishing of Equipment	1. Proper pasting of gasket	Major	Visual	100%	-do-	-do-	-do-	2	-	1	
		2. Earthing busbar	Major	Physical	100%	-do-	-do-	-do-	2	-	1	
4.0 Final Inspection												
4.1	Overall	1. Dimensional & sheet thickness	Major	Physical	100%	BHEL appd drawing & Data sheet	BHEL appd drawing & Data sheet	IR	2	1	-	
		2. Gen arr. & B.O.M	Major	Visual	100%	-do-	-do-	-do-	2	1	-	
		3. Aesthetic Look, Straightness, skewness, Door alignment, Labels etc.	Major	Visual	100%	-do-	-do-	-do-	2	1	-	
		4. Provision of lifting arrangement	Major	Visual	100%	-do-	-do-	-do-	2	1	-	
		5. Proper earthing	Major	Visual	100%	-do-	-do-	-do-	2	1	-	
		6. Gasketing (Check with 1mm wire)	Major	Visual	100%	-do-	-do-	-do-	2	1	-	
		7. Gland plate arrangement	Major	Visual	100%	-do-	-do-	-do-	2	1	-	
		8. Mounting arrangement	Major	Visual	100%	-do-	-do-	-do-	2	1	-	
		9. Wiring quality	Major	Visual	100%	-do-	-do-	-do-	2	1	-	
		10. Paint shade, Adhesion & thickness check	Major	Visual	100%	-do-	-do-	-do-	2	1	-	
		11. Door Functioning	Major	Operation	100%	-do-	-do-	-do-	2	1	-	
		12. Mounting & Proper Fixing of all components	Major	Visual	100%	-do-	-do-	-do-	2	1	-	
		13. Smooth operation of all Switches PUSH Buttons etc.	Major	Operation	100%		-do-	-do-	2	1	-	
		14. Alarm & Protection	CR	Elect	100%	BHEL appd drawing & Data sheet & other Relv IS	BHEL appd drawing & Data sheet & other Relv IS	Test Report	2	1	-	
BHEL			PARTICULARS		BIDDER/VENDOR							
			NAME									
			SIGNATURE									
			DATE					BIDDER'S/VENDOR'S COMPANY SEAL				
LEGEND : 1 - BHEL/ CUSTOMER 2 - VENDOR 3 - SUB- VENDOR P - PERFORM W - WITNESS V - VERIFICATION												

		QUALITY PLAN		CUSTOMER: RAJASTHAN RAJYA VIDYU		PROJECT TITLE : 2X660 MW SURATGARH STPP		SPECIFICATION NO. : PE-TS-392-508-E002				
				UTPADAN NIGAM LIMITED								
				BIDDER/ VENDOR :		STANDARD QP NO. : PE-QP-999-508-E003, REV. 0		SPECIFICATION TITLE: TECHNICAL SPECIFICATION		DOC. NO. :		
SHEET 6 OF 6		SYSTEM		220V DC SYSTEM		ITEM : BATTERY CHARGER						
SL. NO.	COMPONENT/OPERATION	CHARACTERISTIC CHECK	CAT.	TYPE/ METHOD OF CHECK	EXTENT OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORM	FORMAT OF RECORD	AGENCY			REMARKS
									P	W	V	
1	2	3	4	5	6	7	8	9	10			11
4.2	Electrical Testing	1) Burn in check at 50°C for 48 hrs in energized condition	Major	Electrical	100%	BHEL Spec	BHEL Spec	IR	2	-	1	Burn in test to be performed before offering for BHEL Inspection
		2) AVR operation test with input voltage variation of +/- 10%, frequency variation and combined voltage-frequency variation.	Major	Electrical	100%	-do-	-do-	-do-	2	1	-	
		a) No Load				-do-	-do-	-do-	2	1	-	
		b) Half Load				-do-	-do-	-do-	2	1	-	
		c) Full Load				-do-	-do-	-do-	2	1	-	
		3) Ripple test	Major	Electrical	100%	-do-	-do-	-do-	2	1	-	
		a) No Load				-do-	-do-	-do-	2	1	-	
		b) Half Load				-do-	-do-	-do-	2	1	-	
		c) Full Load				-do-	-do-	-do-	2	1	-	
		4) Logic simulation/interlocks/ General Operation Test	Major	Electrical	100%	-do-	-do-	-do-	2	1	-	
		a) Trickle / boost mode selector switch operation	Major	Electrical	100%	-do-	-do-	-do-	2	1	-	
		b) Auto/ manual selector switch operation	Major	Electrical	100%	-do-	-do-	-do-	2	1	-	
		c) Soft start feature check	Major	Electrical	100%	-do-	-do-	-do-	2	1	-	
		d) Uniform step-less trickle mode voltage adjustment in auto / manual operation	Major	Electrical	100%	-do-	-do-	-do-	2	1	-	
		e) Boost charge mode current adjustment from 50% to 100 % continuously	Major	Electrical	100%	-do-	-do-	-do-	2	1	-	
		5) Control circuit & charger status indication test	Major	Electrical	100%	-do-	-do-	-do-	2	1	-	
		6) Load Limiter Operation	Major	Electrical	100%	-do-	-do-	-do-	2	1	-	
		7) Heat Run Test	Major	Electrical	1 sample	-do-	-do-	-do-	2	1	-	
		8) Dynamic response test	Major	Electrical	100%	-do-	-do-	-do-	2	1	-	
		9) Input AC current measurement test	Major	Electrical	100%	-do-	-do-	-do-	2	1	-	
		10) Degree of protection Check for IP 4X	Major	Electrical	100%	-do-	-do-	-do-	2	1	-	
		11) I.R Test	Major	Electrical	100%	-do-	-do-	-do-	2	1	-	
		12) H.V Test	Major	Electrical	100%	-do-	-do-	-do-	2	1	-	
		13) Efficiency and power factor measurement	Major	Electrical	100%	-do-	-do-	-do-	2	1	-	
5	Battery Fuse Box	1) Dimensional check	Major	Physical	100%	BHEL appd G.A drg.	BHEL appd G.A drg.	-do-	2	1	-	
		2) Fuse Rating	Major	Visual	100%	BHEL appd Data sheet	BHEL appd Data sheet	-do-	2	1	-	
		3) I.R Test	Major	Electrical	100%	-do-	-do-	-do-	2	1	-	
6	Discharge Resistor	1) Dimensional check	Major	Physical	100%	BHEL appd G.A drg.	BHEL appd G.A drg.	-do-	2	1	-	
		2) Resistance rating	Major	Electrical	100%	BHEL appd Data sheet	BHEL appd Data sheet	-do-	2	1	-	
		3) I.R Test	Major	Electrical	100%	-do-	-do-	-do-	2	1	-	
5.0	CABLE LUGS & GLANDS	Visual	MA	-	100%	BHEL approved GA drg, data sheet	BHEL approved GA drg, data sheet	-do-	2	1	-	
** : IF THESE ITEMS ARE PURCHASED FROM BHEL APPROVED SUB VENDOR THEN IR NOT REQUIRED, HOWEVER CERTIFICATE OF CONFORMANCE TO BE SUBMITTED TO BHEL FOR ACCEPTANCE.												
BHEL			PARTICULARS			BIDDER/VENDOR						
			NAME									
			SIGNATURE									
			DATE						BIDDER'S/VENDOR'S COMPANY SEAL			
LEGEND : 1 - BHEL/ CUSTOMER 2 - VENDOR 3 - SUB- VENDOR P - PERFORM W - WITNESS V - VERIFICATION												