

RFQ: MGR0000030

INDEX SHEET FOR OPEN TENDER SPECIFICATION

**ITEM DESCRIPTION: 24V DC & 220V DC SCR based charger
systems with DCDB & BHMS**

**CUSTOMER: NUCLEAR POWER CORPORATION OF INDIA
LIMITED**

PROJECTS:KAKRAPAR ATOMIC POWER PROJECT-Units#3&4 and
RAJASTHAN ATOMIC POWER PROJECT-Units#7&8

<u>PAGE NO.</u>	<u>CONTENT</u>
02	Request For Quotation-Brief description of items
03-79	Technical Specification for 24V DC System (PQC is mentioned in page nos.:06 & 07)
80-154	Technical Specification for 220V DC System (PQC is mentioned in page nos.:83 & 84)
155-189	Commercial Terms and Conditions comprising of: 1) Special Commercial Conditions of contract 2) Instructions To Bidders and 3) General Commercial Conditions of contract

Important Information :

Last Date and Time of Tender Submission : 05/10/2015 upto 13:00 Hrs.

Date and Time of Tender Opening : 05/10/2015, 13:30 Hrs.


For any Clarifications/Correspondence, please contact: 1. Mr. Mounish G
Purchase Officer,
CE-MM-PR,BHEL-EDN

Contact details - E-mail ID:mounishg@bheledn.co.in, Office No.(Direct):080-2698-9576

2. Mr. Amit Kumar Sharma
Deputy Manager,
CE-Engg-BPE(D),BHEL-EDN

Contact details - E-mail ID:sharmaak@bheledn.co.in, Office No.(Direct):080-2699-8885

REQUEST FOR QUOTATION

	BHARAT HEAVY ELECTRICALS LIMITED Electronics Division PB No. 2606, Mysore Road Bangalore - 560026 INDIA	RFQ NUMBER: MGR0000030 RFQ DATE : 09.SEP.2015	Due Date 05.OCT.2015 Time: 13:00 HRS VENUE : NEW ENGG. BLDG
MM:PU:RF:003			

Customer/Project: NPCIL/KAPP (2x700MWe)-TISCS(TG) Package for Units#3&4 and NPCIL/RAPP (2x700MWe)-TISCS(TG) Package for Units#7&8 Item: 24V DC & 220V SCR based CHARGER SYSTEMS with DCDB & BHMS	(for all correspondence) Purchase Executive : Mounish G. Phone : 080 2698 9576 Fax : 080 2698 9227 E-mail: mounishg@bheledn.co.in
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Please submit your lowest quotation subject to our terms and conditions attached for the material mentioned below. The quotation must be enclosed in a sealed envelope / Fax superscribed with RFQ no. and due date, should reach us on or before the due date by **13.00** hours IST and will be opened on the same day at **13.30** hours at the venue mentioned above. **PLEASE DROP THE OFFER IN THE BOX PROVIDED AT RECEPTION.**

Sl No.	Description	Qty	Unit	Delivery qty	Delivery Date
1	PR0150000480 24V DC Thyristor based Charger System with DCDB	8	ST	2	08.MAR.2016
				2	08.MAR.2016
				2	08.JUNE.2016
				2	08.JUNE.2016
2	PR0150000928 MANDATORY SPARES FOR 24V DC CHARGERS	2	ST	1	08.MAR.2016
				1	08.JUNE.2016
For the detailed description of items/BOM under Sl. Nos:1 to 4, please refer the 'Scope of Supply' section in the document named 'Technical Specification' for 24V DC and 220V DC Charger systems (Common for both projects).					
3	PR0150000995 220V DC Thyristor based Charger system with DCDB	8	ST	2	08.MAR.2016
				2	08.MAR.2016
				2	08.JUNE.2016
				2	08.JUNE.2016
4	PR0150001003 Mandatory spares for 220V DC chargers Mandatory spares for 220V DC Thyristor based Charger	2	ST	1	08.MAR.2016
				1	08.JUNE.2016

Total Number of various Items -4

Please note that the tender will be opened in the presence of the bidders or his authorised representatives (maximum two per organisation) who choose to be present with authorisation letters. Refer annexure for the terms and conditions.

~~Preference will be given to vendors who accepts our standard payment terms i.e 100% payment - 30 days after receipt of material at our works subject to acceptance~~

Please specify Terms of delivery, Excise duty, sales tax, Ex-BHEL, Ex-works surcharge, Insurance,P&F, Freight and other taxes very clearly .

For evaluation, exchange rate(TT selling rate of SBI) as on scheduled date of tender opening (Part-I bid in case of three part bid) shall be considered.

The offers of the bidders who are on the banned list and also the offer of the bidders, who engage the services of the banned firms, shall be rejected. The list of banned firms is available on BHEL web site www.bhel.com

- i). This is only RFQ and not an order.
- ii). In all correspondence, quote RFQ No. & due date.
- iii). In Quotation, BHEL material code / RFQ Sl. No. should be mentioned clearly.
- iv). Quotation Envelope / Fax not superscribed with RFQ No. and due date is liable for rejection.
- v). Quotation should remain valid for a minimum period of 120 days from due date.
- vi). In case of non-receipt of Quotation or regret letter for 3 consecutive RFQs you are liable to be removed from our vendors list.
- vii). All Prices should be written in words and numbers.
- viii). Excise Chapter Heading should be mentioned for all items where VAT is applicable .

Please refer Clause B. GUIDELINES FOR PREPARATION OF OFFER in 'INSTRUCTIONS TO BIDDERS (Common for all RFQs)' and Clause C. GUIDELINES FOR OFFER SUBMISSION IN 'INSTRUCTIONS TO BIDDERS (Common for all RFQs)'.

For and On behalf of BHEL.
Mounish G, CE-MM/PR,
 BHEL-EDN
 Page 1 OF 1



A4-10

CE/416/NPCIL/24VDC

REV 00

PAGE 01 OF 01

**PROJECTS : KAPP UNIT 3 & 4 2X700MWe (TISCS Package)
: RAPP UNIT 7 & 8 2X700MWe (TISCS Package)**

CUSTOMER : M/s. NPCIL, MUMBAI

**TECHNICAL SPECIFICATION
FOR
24V DC POWER SUPPLY SYSTEM**

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COMPANY.

REVISION: 00

APPROVED

RAJASEKAR K

PREPARED

AMIT KR SHARMA

ISSUED

416

DATE

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A4-11

CE/416/NPCIL/24VDC/INDEX

REV 00

PAGE 01 OF 01

CONTENTS

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SECTION	DESCRIPTION
A	GENERAL INSTRUCTIONS TO BIDDERS
B	PRE-QUALIFICATION REQUIREMENTS
C	SCOPE OF SUPPLY
D	TECHNICAL REQUIRMENTS
E	ANNEXURES



A4-11

CE/416/NPCIL/24VDC/A

REV 00

PAGE 01 OF 01

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SECTION- A

GENERAL INSTRUCTIONS TO BIDDERS:

Introduction: Bidders are required to offer 24V DC Charger system to be used for powering DCS panels of secondary cycle of Nuclear Power Plants. All required documents against this Tender/Specification shall be submitted in English only.

Pre-qualification requirements (PQR) are clearly mentioned in Section-B of this Specification. In case Bidder does not meet Pre-qualification requirements, their offer will be summarily rejected and Bidder's Technical offers will not be evaluated.

1. Evaluation methodology:

- a) BHEL shall initially open Bidder's PQR documents (to be submitted as per Section-B clause-AA) only, for review, evaluation & acceptance by BHEL.
- b) Technical bids shall be opened for review and further consideration for only those bidders who meet Pre-qualification requirements. Technical offer of bidders who does not meet Pre-qualification requirements will not be opened for further consideration and shall be declared as technically rejected.
- c) Bidders declared qualified for meeting requirements mentioned in section B and are presently not registered with BHEL EDN Bangalore for supplying the charger system, shall be informed by email to submit online BHEL vendor registration form at www.bhel.com.
- d) Bidders declared qualified for meeting section-B requirements and are not approved by end customer (M/s NPCIL) for the project, their credentials documents as provided by bidder (under section-B), shall be forwarded to NPCIL for approval.
- e) Bidders who are not approved by customer (M/s NPCIL), their offers shall be technically rejected and shall not be considered for further process for procurement.

2. Submission of documents:

- a. Documents pertaining to Pre-Qualification requirement Section B clause AA should be submitted in a Separate cover. "Section B clause AA" should be written on this cover.
- b. Documents pertaining to Pre-Qualification requirement (Section B clause BB) should be submitted in a Separate cover marked as "Section B clause BB".
- c. Technical offers/proposals pertaining to Sections C & D should be submitted in a separate cover marked as "Technical offer".

3. Whenever required during evaluation of PQR and Technical offers/bids, vendor should be present at BHEL Electronic Division, Bangalore, for discussions. Further in the event of order, during approval of the Vendor documents by Customer, Vendor shall accompany BHEL representative for discussions.

4. This specification does not prohibit any vendor to submit their offer along with clause wise deviation from the specification.



A4-11

CE/416/NPCIL/24VDC/B

REV 00

PAGE 01 OF 02

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SECTION- B

Clause AA

Pre-Qualification Requirements (PQR) of Bidders for 24V DC charger system:

- a) The bidder should be a reputed manufacturer who have been in the field of manufacturing DC Chargers for not less than 10 years and have designed, engineered, manufactured and supplied 24V DC Chargers which are equal to or superior than specification provided in this document, to atleast two nuclear / thermal power units which are in successful commercial operation for at least 2 years under similar condition as specified in this document. Supporting documents like PO copies, performance certificates issued by user, MOM for commissioning and handing over of system etc should be provided.
- b) Original Equipment Manufacturers (OEM) based outside India, who are submitting offer for this tender, shall have authorized representatives in India for support related to Documentation, technical support, troubleshooting, Erection, Commissioning & any other co-ordination work. Letter from OEM detailing Indian representative organization details should be provided.
- c) OEM to furnish an undertaking letter that in case of change in Indian representative / agent, OEM shall continue to support the supplies made through this tender.
- d) BHEL shall issue call for service / commissioning with maximum 15 days' notice. Bidder to submit undertaking letter for agreeing to visit project sites within above notice period.



A4-11

CE/416/NPCIL/24VDC/B

REV 00

PAGE 02 OF 02

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SECTION- B

Clause - BB

Along with the documents related to PQR above, following details shall also be included in the Offer:

1. Technical literature / datasheets of offered System (as per technical specification Section – C & D) to be submitted.
2. Submit List of Projects for which offered system is supplied, commissioned and working satisfactorily for more than 2 years (as per PQR requirements).
3. Name & registered address of the Indian branch office or Indian representative for support of E&C and after sales service with Organization chart.
4. Bidder shall have facility in India for Engineering activities, preparation of Documents, trouble shooting and commissioning of the system. Documents substantiating these to be submitted.
5. If Bidder is not Original Equipment Manufacturer (OEM), then Bidder to include Authorization letter from OEM for Design, Engineering, Manufacture, Testing, supply, Erection, Commissioning and Servicing of the offered System. This Authorization letter provided by OEM to Bidder shall indicate the Type and Duration of Validity of the agreement.

Important note: All bidders, irrespective of being already registered/approved by BHEL/NPCIL, should furnish all documents mentioned in Section-B failing which their offer is liable to be rejected.



A4-10

CE/416/NPCIL/24VDC/SOS

REV 00

PAGE 01 OF 03

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SCOPE OF SUPPLY

REVISION: 00

APPROVED

RAJASEKAR K

PREPARED

AMIT KR SHARMA

ISSUED

416

DATE

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A4-11

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REV 00

PAGE 02 OF 03

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1. SCOPE OF SUPPLY

A) Main item supplies shall consist of following:

Sl no	Description of Item	Quantity for KAPP unit 3&4	Quantity for RAPP unit 7&8
1	Float cum Boost Main charger of 625Amp	4nos	4nos
2	Standby Boost charger of 625Amp	2nos	2nos
3	DCDB	4nos	4nos
4	Switch Fuse Unit	4nos	4nos
5	BHMS system	4nos	4nos
6	ETHERNET MODBUS connectivity to DCS (incl all items required)	6nos	6nos
7	Erection supervision, commissioning, site testing and handing over	2sets*	2sets*

* Each set consisting of 2 nos of main charger and 1 no of standby charger

B) Mandatory spares: The Spares are to be supplied as below separately for each project:

- 10% of the plug-in sub assemblies/units or at least one unit, whichever is more.
- 10% of the components like thyristors/transistors not mounted on the sub assemblies/units or at least one component whichever is more.

Complete BOM of all system mentioned above & mandatory spares BOM derived from it should be provided.

The bidder shall provide unit rate of each main item like main charger, standby charger, DCDB, Switch Fuse unit, BHMS System, Erection supervision & commissioning charges in price bid. Unit rate of each item of mandatory spares must be provided in price bid.

2. Training:

4 Nos. of NPCIL engineers shall be trained at supplier's works for operation and maintenance. To & fro conveyance charges, boarding & lodging charges will be borne by the NPCIL. Training charges, if any, shall be mentioned in the offer. If training is free, the same shall also be mentioned in the offer clearly.

3. Documents to be submitted:

3.1 Following documents shall be furnished to BHEL as a minimum, apart from any other documents required to be submitted as called elsewhere in the specification.

3.2 **Along with the Technical offer:** For technical evaluation, vendor must send one (01) set of the following documents in hard copy.

- Single line diagram, Circuit diagrams, schematic drawing
- GA drawings, weight, outline dimension
- Fault co-ordination details
- Technical write-up / Technical literature / Catalog of each major component
- Wiring diagram/interconnecting arrangement details
- Complete Bill of Material with make & Model
- Clause-wise compliance/deviation list, clearly indicating compliance/deviation to all the clauses mentioned in this specification

NOTE: - Later no explanation on noncompliance or deviation, stated or observed, shall be acceptable. Incomplete offers (without documents / not relevant documents as mentioned above) will be technically rejected without any notice.



A4-11

CE/416/NPCIL/24VDC/SOS

REV 00

PAGE 03 OF 03

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3.3 After placement of Purchase Order within 1 week: For BHEL/Consultant/Customer approval, Vendor must send Eight (8) sets of the following documents in hard copy & one (01) CD in soft copy, for each project.

- a) All documents Sl. No 01 ~ 13 as above.
- b) Interfacing diagram & cable type details used or suggested.
- c) Quality Plan format enclosed as part of the specification.
- d) Test Procedure: The equipment shall be tested as per approved test procedure.

3.4 After Type Test but before Inspection : For BHEL/Consultant/Customer approval, vendor must send two (2) Sets of the following documents in hard copy & one in soft copy.

- 01. Type test reports/Certificates as per specification/approved QP
- 02. Preliminary Instruction /O&M Manual

3.5 Along with the materials being dispatched: Vendor must send five (5) sets of the following “As Built & Approved” status documents four (4) in hard copies & one (1) in soft copy.

- (a) Instruction/O&M Manual
- (b) Bill of Material
- (c) Data Sheets
- (d) Technical literatures/Catalogs
- (e) Drawings GA/layout/wiring/interconnection/schematic, etc.)

Instruction/O&M Manual: It shall include

- a. General Information
- b. Principal technical data.
- c. Description of components.
- d. Description of various controls with block schematics.
- e. Operating instructions.



A4-10

CE/416/NPCIL/24VDC/TR

REV 00

PAGE 01 OF 20

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TECHNICAL SPECIFICATIONS OF 24V DC CHARGER (MAIN AND STANDBY CHARGER)

REVISION: 00

APPROVED

RAJASEKAR K

PREPARED

AMIT KR SHARMA

ISSUED

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DATE

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A4-11

CE/416/NPCIL/24VDC/TR

REV 00

PAGE 02 OF 20

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1.0 SCOPE

The scope of this specification covers the design, manufacture, testing, supply, delivery and commissioning of the Main and standby Battery Chargers for KAPP 3&4 and RAPP 7&8 projects.

2.0 CONTENTS

The requirements of this specification are presented under following section headings.


Description	Section
Applicable standards, specifications and drawings.	3
Materials, processes and workmanship.	4
General functions and description.	5
Design requirements.	6
Inspection, tests and reports	7
Tests	8
Packing and Shipment	9
Information required with the bid	10
Technical details required with the bid.	Annexure-A
Quality Assurance Plan (Sample)	Annexure-B
Details of alarms and indications	Annexure-C
Block diagram of charger	Annexure-D

3.0 APPLICABLE STANDARDS, SPECIFICATIONS AND DRAWINGS

All documents listed below constitute a part of this specification. In the event that certain requirements of specifications, drawing or data listed below conflict with the requirements of specification, the requirements of this specification shall govern.

3.1 Applicable Standards

- IS-11171 : Dry type power transformers
- IS-11794 : Lamination for transformers & inductors for telecom & electronic equipment
- IS-3895 : Monocrystalline semiconductor rectifier cells and stacks
- IS-4540 : Monocrystalline Semiconductor rectifier assemblies and equipment
- IS-5051 : Relays for Electronics and Telecommunication Equipment
- IS-60947 : Specification for Low-Voltage Switchgear and Control gear
- IS-60898 : Miniature circuit breaker
- IS-14901 : Semiconductor Devices - Discrete Devices and Integrated Circuits
- IS-2705 : Current transformers
- IS-3156 : Voltage transformers
- IS-5553 : Reactors (Inductors)
- IS-13703 : Low voltage fuses for voltages not exceeding 1000 V AC or 1500 V DC
- IS-1248 : Direct Acting Indicating Analog Electrical Measuring Instruments & Accessories
- IS-5786 : Fixed resistors general purpose, low power
- IS-7788 : Single phase traction power converters
- IEC-60146 : Semiconductor converters
- IS-8872 : Variable resistors
- IS-2786 : Ceramic dielectric capacitors
- IS-4317 : Aluminium electrolytic capacitors with non solid electrolyte
- IS-4794 : Push button switches
- MIL 883G : Test method standard: Microcircuits
- IS-694 : PVC insulated cables for working voltages up to and including 1100V
- IS-513 : Cold rolled low carbon steel sheets and strips
- IS-6005 : Code of practice for phosphate coatings of iron and steel
- IS-5 : Colour for ready mixed paints

		 <p>A4-11</p>	<p>CE/416/NPCIL/24VDC/TR</p> <p>REV 00</p> <p>PAGE 03 OF 20</p>
<p style="writing-mode: vertical-rl; transform: rotate(180deg);"> COPY RIGHT AND CONFIDENTIAL THE INFORMATION ON THIS DOCUMENT IS THE PROPERTY OF BHARAT HEAVY ELECTRICALS LIMITED. IT MUST NOT BE USED DIRECTLY OR INDIRECTLY IN ANY WAY DETRIMENTAL TO THE INTEREST OF THE COMPANY. </p>		<p>IS-9000(Part-III) :Basic environmental testing procedure for electronic & electrical item: Dry heat test</p> <p>IS-9000 (Part V) :Basic environmental testing procedures for electronic & electrical items: Damp heat (cyclic) test</p> <p>IEEE-946 : IEEE recommended practice for the design of safety related DC auxiliary Power systems for Nuclear Power Generating Station</p> <p>IEEE-650 : IEEE standard for qualification of Class-1E static battery chargers and inverters for Nuclear Power Generating Station</p> <p>IEEE-344 : IEEE recommended practices for seismic qualification of Class 1E equipment for Nuclear Power Generating Station</p>	
		<p>3.2 Applicable Specifications</p> <p>PP-E-1443: Specification for the manufacture of single sided, double sided and multi layered printed wiring boards.</p> <p>PP-E-2061: Specifications for requirements of components for instrumentation items.</p> <p>PC-E-409: Technical specification for (polyamide) & accessories for non radiation area for 700MWe.</p> <p>PC-E-710 : Engineering Standard for Electromagnetic Compatibility Qualification of C&I Equipment</p> <p>4.0 MATERIALS, PROCESSES AND WORKMANSHIP</p> <p>4.1 Materials and Processes</p> <p>The materials, processes and standard parts which are not specifically described herein and which are necessary to meet this specification shall be of first class commercial quality and in accordance with the good practice pertinent to the equipment's. All components used shall be "type approved" or shall have gone through a satisfactory quality assurance test programme. As far as possible components shall be adequately derated so as to increase the system reliability. Use of integrated circuits is preferred. All the semiconductor components shall be of silicon.</p> <p>4.2 Workmanship</p> <p>The workmanship shall be of high industrial quality to ensure satisfactory operation and service life of 40 years in accordance with the provisions of this specification. The units shall be modular and access to any portion of the unit shall be easily available for maintenance and adequate tests points shall be provided for trouble shooting purposes.</p> <p>4.3 Tropicalisation</p> <p>The design, material used, manufacturing and assembly shall be done to render the parts and assembled equipment moisture, fungus, microorganism and termite resistant. Proper surface treatment of the moisture and fungus susceptible parts of the component and their assembly shall be done. Care shall be taken during treatment to avoid its effect on the performance of the component and its assembly.</p> <p>5.0 Environmental conditions</p> <p>Normal operating conditions</p> <p>Ambient temperature from 8°C to 45°C and relative humidity up to 90 %</p> <p>Occasional/Storage conditions</p> <p>Ambient temperature from 5°C to 55°C and relative humidity up to 95 %</p>	



A4-11

CE/416/NPCIL/24VDC/TR

REV 00

PAGE 04 OF 20

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6 System Concept of 24V DC charger

The Battery Charging equipment shall comprise of Charger-I & Charger-II and one common standby charger for each unit (refer charger block diagram). The input supply to the DCPS shall be fed through a two winding transformer to ensure proper galvanic isolation from the input source. The DCPS shall be able to produce output voltage ranging from 24V DC to 31.2V DC adjustable through potentiometer. The DCPS shall have soft start feature. SCRs shall be used for converting AC to DC.

There shall be two selector switches on front panel, one switch for Auto/Manual mode selection and second switch for Boost / Equalising / Float operation.

6.1 General features of Float cum boost (FCB) MAIN CHARGER:

The DCPS shall have provision for operating satisfactorily in any of following conditions:

6.1.1 Supply of load at 24V DC (nominal) and float charging of batteries:

The DCPS shall supply control loads at 24V DC nominal and simultaneously trickle charge the battery at float voltage of 28.6V. Diode Voltage Regulator (DVR) in series shall be used so that voltage in the range of 24.7V DC to 26.4V DC is available at DC output bus after the DVR for supplying the load and simultaneously float charge the battery at 28.6V. DVR shall be cut-off at the outage of DC power supply while battery is getting discharged. A bypass switch shall be provided which will bypass the DVRs so that direct charger output is available at DCDB

6.1.2 Supply of load at 24V DC (nominal) & Boost charging of Batteries at 2.4VPC:

Following the loss of AC supply to the 24V DCPS, the Battery will feed the power to 24V DC loads. The discharged Batteries are required to be recharged. The DCPS shall supply control loads at 24V DC (nominal) and simultaneously automatic boost charge the Batteries at boost voltage of 31.2 VDC. Diode Voltage Regulator (DVR) in series shall be used so that voltage in the range of 23.4V DC to 27.6V DC is available at DC output bus after the DVR for supplying the load and simultaneously boost charging the Battery at 31.2 VDC.

The DCPS shall have provision for charging batteries satisfactorily in both Manual and Automatic Mode with the help of selector switch provided on the DCPS front panel

6.1.2.a Automatic Mode:

In the automatic boost charging mode, the DCPS shall charge the batteries with battery charging a preset current limit of 10% of rated battery capacity. The DCPS voltage shall be set at 2.4V/cell i.e. 31.2V for 13cells. As soon as the battery voltage reaches at 30.55V, a timer shall start counting for a preset duration. Voltage shall remain constant at 31.2V during the preset duration. Once the preset time period is over, the charger voltage shall automatically come down to float voltage of 28.6V. The timer shall have provisions for setting time duration of 4hrs / 6 hrs / 8hrs / 10hrs / 12hrs / 14hrs / 18hrs.

6.1.2.b Manual Mode:

In the manual boost charging mode the boost charging voltage shall be adjustable through voltage adjustment potentiometer to the required voltage in the range of 26V to 31.2V. The DCPS voltage shall be set at 2.4V/cell i.e. 31.2V. The DCPS shall charge the battery with current limit of 10% of battery rating. The DCPS shall be manually stopped after three consecutive hourly voltage readings are constant at specific gravity of $1.2 \pm 0:0005$.

A bypass switch shall be provided which will bypass the DVRs so that direct charger output during boost charging is available at DCDB



A4-11

CE/416/NPCIL/24VDC/TR

REV 00

PAGE 05 OF 20

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6.1.3 Supply of Loads at 24V DC (nominal) & also Equalizing Charging of Batteries:

Equalizing charging of lead acid batteries shall be done in the following modes:

6.1.3.a Automatic mode:

In the automatic equalising charging mode, the 24V DCPS shall have provision for charging at constant potential mode i.e. 29.9V (2.3V/cell). The current limit shall be set at 5% of rated battery size. A facility for equalizing charging with preset timer shall be provided with adjustable duration of 2hrs / 4hrs / 6 hrs / 8hrs / 10hrs / 12hrs. After the preset time the DCPS shall change over to float mode and equalizing charging shall be stopped automatically.

6.1.3.b Manual mode:

In the manual equalizing charging mode provision for equalizing 24V DC lead acid battery shall be made with features as mentioned for automatic mode but without a preset timer. The equalizing charging shall be stopped manually after the required duration as per battery manufacturer's recommendation.

6.1.4 Initial Charging of Batteries:

24V DCPS shall be able to provide initial charge to the batteries at constant current of 12% of battery size till the individual cell voltage in the battery bank reaches 2.4V DC. Further 51 amps constant current shall be provided till the battery gets fully charged. Total AH to be fed to the battery shall be 6 times of battery size. DC voltage may reach up to 40.3V


6.2 General features of STANDBY CHARGER (SBC):

The 26V DC Battery Charger shall function as standby charger to the existing 24V DCPS. These will be used for

- Boost charging the battery upon the discharge of the battery following the mains failure
- Equalization charging of batteries
- Supply the load and charging the batteries
- Initial charging of the batteries.

26V DC standby battery charger is connected to 26 V DC lead acid batteries through three position double pole battery selector switch located inside standby charger through switch fuse units respectively. The scheme is shown in the Sketch provided in Annexure-D. The switch fuse units are not mounted inside the battery charger. They are floor mounted type and located in the respective battery rooms. The switch fuse units are also to be supplied by the Charger vendor and these shall be supplied in loose.

The charger is fed from 415V AC. 3 phase, 50 Hz from class-III supply. The input supply to the SBC shall be fed through a two winding transformer to ensure proper galvanic isolation from the input source. The SBC shall be able to produce output voltage ranging from 24V DC to 40.3V DC. The charger shall have soft start feature. SCRs shall be used for converting AC to DC.

			CE/416/NPCIL/24VDC/TR
			REV 00
			PAGE 06 OF 20
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A4-11

CE/416/NPCIL/24VDC/TR

REV 00

PAGE 07 OF 20

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6.2.4 Equalizing charging of batteries:

The battery shall be given an equalizing charge at regular intervals during its life span at constant voltage to correct any inequalities among cells of the battery that may develop during its service. The equalizing charge voltage shall be approximately 2.3V/cell. The SBCs shall provide equalising charging to the batteries in the following modes.

- a) **Automatic mode:** In the automatic equalising charging mode the charger shall have provision for charging at constant potential mode i.e. 29.9V (2.3V/cell). The current limit shall be set at 5% of battery Ah. A facility for equalising charging with preset timer shall be provided with adjustable duration of 2hrs/4hrs/8hrs/12hrs. After the preset time the charger shall change over to float mode and equalising charging shall be stopped automatically.
- b) **Manual mode:** In the manual equalising charging mode provision for equalizing for 26V DC lead acid batteries shall be made but without a preset timer. The equalising charging shall be stopped manually after the required duration as per battery manufacturer's recommendation.

6.2.5 Supply the load and boost charge the batteries:

In addition to boost charging and equalizing charging of batteries, Stand by Battery Charger shall have capability to simultaneously boost charge the batteries and supply normal load. The charger shall have provision of boost charging 26V DC lead acid batteries at 31.2V and simultaneously supply loads.

6.3 Switch Fuse Unit:

Two 24V DC switch fuse units with typical connections shown in drawing in Annexure-D of this specification of suitable current rating shall be provided. Each project unit shall contain two individual switch fuses connected as shown. It should be possible to connect the DCPS, Stand by Battery Charger battery and battery testing load. Bus bars shall be provided for the above in the switch fuse unit. The switches shall, conform to IS-4064. The fuses shall conform to IS-2208. The switch fuse unit shall be floor mounted type.

6.4 Design Parameters

6.4.1 INPUT: The DCPS shall be suitable for operation on a nominal input sinusoidal symmetrical supply of 415V, 3 phase, 3 wire, 50 cycles. The steady state input voltage and frequency variation will be as below.

Voltage variation	+ 10%
Frequency variation	+ 5%
Combined voltage & frequency variation-	+ 10%
Voltage unbalance	+ 3%

The DCPS shall be capable of maintaining the following at the input side:

Input current harmonics	<12%
Power factor	>0.8

6.4.2 OUTPUT OF MAIN CHARGER

Output voltage 24V DC nominal

Output voltage range:

- i) Load 24.7V DC to 26.4V DC after DVR during float mode
23.4V DC to 27.6V DC after DVR during boost mode.

ii) Battery Charging

- a) Float voltage 28.6V(2.2V / cell)
- b) Boost voltage 31.2V(2.4V / cell)



A4-11

CE/416/NPCIL/24VDC/TR

REV 00

PAGE 08 OF 20

6.4.2 OUTPUT OF STAND BY CHARGER

Output voltage 26V DC nominal

Output voltage range

Sl.No.	Charging Mode	26VDC SBC
i)	Initial (ill 3.1 VPC	40.3V
ii)	Float @ 2.2 VPC	28.6V
iii)	Boost @ 2.4 VPC @2.7SVPC	a) 31.2V b) 35.75V
iv)	Equalizing @ 2.3 VPC	29.9V

COMMON DESIGN PARAMETERS FOR MAIN / STANDBY CHARGER

Steady state regulation	Output voltage	$\pm 1\%$ of set voltage
Transient regulation		$\pm 20\%$ of set voltage
(On sudden application or removal of 100% load)		
Recovery time of voltage from transient		500ms
condition to rated output voltage		
Ripple content in DC output		Less than 2% (with battery disconnected)
Boost charging current limit		10% of rated full load current
Type of earthing		Floating w.r.t ground
Maximum noise level		75 dB
Efficiency		$\geq 80\%$ at full load and nominal input / output
Overload Capacity		: 110% for 30mins ; : 150% for 1 minute : MCB Clearance as per section 8.2.10

6.5 Protection Controls & Power:

6.5.1 Protection:

D.C Output Side: The circuit interruption on DC side shall be by means of DC CB.

The vendor shall provide.

- Instantaneous trip protection** in the event of a short circuit if the DCPS is connected with reverse polarity to the station battery.
- Instantaneous trip protection** to provide over current protection to each rectifier / thyristor. Fuses shall be provided for this protection, they shall be specifically designed for semiconductor protection. These fuses shall be properly co-ordinate with main output protection as described in a) above. All the fuses shall have an alarm contact with trip indication or alarm fuse in parallel with the power fuse having alarm contact with trip indication. In addition to fuse protection, thyristor pulse blocking method shall be adopted.
- Over voltage trip protection** by blocking the Rectifier and tripping the input AC CB. The over voltage device shall have continuous setting over the whole range and shall be equipped with inherent time delay so as to be insensitive to transient over voltages (spikes in grid). Contact shall be available for alarm also.
- Overall current limit:** The DCPS shall continue to work on overload of 110% for 30 minutes, 150% for 1minute and 200% for fuse clearance time. Charger may be tripped after above mentioned time duration at specified overload. The current limits shall be fast acting and shall be able to withstand a switched load from no load conditions 10 full load with more than 20% transient over current in the voltage range of 24V to 31.2V.

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A4-11

CE/416/NPCIL/24VDC/TR

REV 00

PAGE 09 OF 20

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- e) Output Contactor shall be tripped when mains have failed, and alarm plus visual indication shall be provided.
- f) Surge and lightning protection dv/dt and di/dt protection for thyristors.
- g) The Supplier may provide any other protection or alarm which is necessary for the reliable trouble free and efficient performance of the equipment

6.5.2 Control Circuits:

Semi-conductors:

All semiconductor devices shall be silicon. All semiconductors shall have heat sinks of sufficient thermal rating so that the junction temperature of the devices will remain within the non-destructive limits with sufficient margin at an ambient of 45Deg C. Silicon Control Rectifier (SCR) shall be used for rectifier. All semiconductor devices shall be adequately derated to prolong the life of devices, but shall not be derated below 0.7 of normal voltage and current or 0.5 of the normal rated power.

Transistors: The transistors are to be derated to as follows:

Collector current: 80%

Any other Voltage: 70%

Diode: The diodes are to be derated to as follows:

Forward current: 50%

Peak reverse voltage: 50%

Control Fuses: All control fuses for protection of semiconductor shall be semiconductor fuse

Capacitors: The use of electrolytic capacitors shall be kept to an absolute minimum and wherever possible tantalum capacitors shall be used. Capacitor voltage shall be derated to 50%.

Terminal Blocks: Terminal block shall be of Polyamide (nylon 6.6) and brass clamping yoke. Fire rating shall be V0 as per UL-94. Current bar shall be of copper alloy.

Resistors: All resistors shall be preferably metal oxide type and in general shall not be rated more than 50% of the manufacturer's rating. Preset Potentiometer shall be used instead of fixed resistors wherever wide range voltage and current adjustments are necessary and shall be provided with locking devices. Wire wound resistors shall be used in snubber circuits and as bleeder resistors. Power of resistors shall be derated to 50%.

Relays: All relays shall be compact, hermetically sealed and dust proof to provide maximum reliability and shall be free from contact deterioration. Freewheeling diode shall be provided as integral part of relay.

Connectors: All connectors shall be suitably plated to provide good contact. The connector shall be designed in a manner to avoid plugging in wrong direction.

Construction: All devices shall be manufactured on a modular basis to enable rapid replacement of a faulty module by a spare module.

Monitor Points: Monitor points shall be provided for rapid fault finding.

Meters: Indicating meters on the front panel of DCPS shall be preferably digital type with Minimum resolution of 1V for voltmeter and 1A for ammeter. All meters shall have full scale accuracy of $\pm 2\%$ minimum.

6.5.3 Power Circuits

6.5.3.1 Transformer/Choke: The power transformer/choke shall be derated to as follows:

Voltage: 90%

Current: 80% (including harmonics)

6.5.3.2 Capacitors: Electrolytic capacitors shall be used for DC purpose and non-electrolytic capacitors shall be used for AC purpose. Capacitor voltage shall be derated to 50%.



A4-11

CE/416/NPCIL/24VDC/TR

REV 00

PAGE 11 OF 20

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6.7.4 LED Indication on DCPS (front panel)

- a) DCPS output voltage high
 - b) DCPS input voltage high / low
 - c) Fuse failure
 - d) Load on standby DCPS
 - e) DCPS output overload (after DVR)
 - f) DCPS output breaker/contactors tripped
 - g) Fan failure
 - h) Equipment over temperature
 - i) Control power supply failure
 - j) Battery on load
 - k) Redundant DCPS not available
- Alarm reset button should be provided on front panel of each charger)

6.7.5 LED ON MIMIC

- a. Input CB ON
- b. Rectifier ON
- c. Output CB ON
- d. Battery CB ON

6.7.6 Besides above following general purpose LEDs shall be provided:

- a. Input RY, VB, BR
- b. Manual Mode
- c. Auto mode
- d. Float charging
- e. Initial charging
- f. Equal ise charging
- g. Boost charging @ 2.4 VPC
- h. Boost charging@ 2.75 VPC
- 1. Timer ON

6.7.7 Meters on DCPS front panel

The following meters shall be provided on the front panel of the DCPS with proper labeling.

1. AC Voltmeter at input
2. AC Ammeter at input
3. Ammeter for battery charging current
4. DC Voltmeter at output
5. DC Ammeter at output
6. DC Voltmeter for standby voltage

All meters shall be LED 7 segment digital type of size approximately 48 x 96 mm and shall be suitable for flush mounting. Zero adjustment shall be possible from front side. Meters for AC voltage, DC current measurement shall be 4 and ½ digits while meters for AC current and DC voltage shall be 3 and ½ digits. Accuracy of meters shall be 1% full scale or better. All voltage circuits of meters shall have fuses. Meters shall comply IS: 8573.

6.7.8 Remote Display and Annunciation

The parameters listed below shall be converted in the form of 1-5V signals by the supplier. These signals shall be galvanically isolated for 1.5KV. The measurement accuracy shall be + 0.5%. These signals shall be wired to separate terminal block and then connected to communication interface card (Ethernet communication) as mentioned in section 6.6.2. The description and process range of the 1-5V signals to be transmitted are given below.

Description Process Range

1. DCPS input voltage 0-600V AC
2. DCPS input current 0-75A AC
3. Battery charging current 0-100A DC
4. DCPS output voltage 0-40V DC
5. DCPS output current 0-900A DC

5nos of analog signal as shown in charger block diagram shall be provided through dual output (1-5V) transducer for connectivity to DCS and NPCIL system.



A4-11

CE/416/NPCIL/24VDC/TR

REV 00

PAGE 12 OF 20

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6.8 CONSTRUCTION:

6.8.1 Rectifiers and Thyristors:

Rectifiers shall be of mono-crystalline type silicon, capable of continuous output at specified voltages. It shall have high power efficiency and shall be equipped with voltage on AC side of rectifier control. The rectifier shall be 12 pulse, thyristor based.

HRC fuses shall be provided with trip indication along with potential free annunciation Contacts.

The silicon rectifiers or thyristors bank shall be natural air cooled.

The rectifiers or thyristors shall be protected against over voltages due to chopping surges and hole-storage with the aid of snubbers.

6.8.2 Transformers:

The transformer shall be natural air cooled dry type. The transformer design shall take care of abnormal stresses due to external short circuits. The rating of the transformer shall correspond to the rating of the rectifier considering all the losses. The transformer may have full capacity primary tap at a suitable percentage of its nominal voltage to produce D.C. voltage to equalize charge the batteries. The transformers shall be noise free. Class of insulation of transformer shall be class H. Temperature rise of the transformer shall not be more than 90deg C. The transformer shall be designed, manufactured & tested as per latest issue of IS-11171.

6.8.3 Dimensions:

The overall dimension of each charger including DCDB shall be within 2400mm width x 800 mm depth x 2300 mm height

The overall dimension of each switch fuse unit shall be within 800 mm width x 500mm depth x 1500mm height considering the bending radius of cables to be terminated.

6.8.4 Printed Circuit Boards:

All small electrical and electronic components shall be wired on PCBs. The PCBs shall be segregated in the form of cards according to function/system and shall have printed name for function of PCB on both sides. PCBs shall be mounted in such a way that all components along with LED indication and potentiometers are visible / accessible for easy replacement and maintenance. PCB housing shall be provided with suitable guides so, that only insertion of correct PCB in right manner is possible. The PCBs shall be stacked properly within cubicles.

Double sided PCBs of glass epoxy based, copper laminated type shall be used with high quality soldering and shall be suitably enamel coated for protection against moisture and dust to ensure longer life. The PCB shall be designed to meet the requirement specified in NPC specification PPE-I443 (To be issued to the successful bidder) All PCBs shall be housed in semi draw out modular construction

6.8.5 Housing and Foundation:

The DCPS cabinet shall be fabricated from cold rolled steel sheets having a minimum thickness of 1.6mm. It shall be bidder's responsibility to select suitable sheet thickness (especially for load bearing doors) to avoid any slagging or bending. Fabrication and design of the enclosure shall be such as to make the complete assembly rigid; self supporting and free from magnetic vibration, twist and Weave. Enclosure shall be indoor type, floor mounting, suitable for forced air cooling and shall be completely dust and vermin proof. All steel parts including walls, doors and roof shall be adequately supported and stiffened to prevent flexing. All removable panels supplied for access to die interior of the housing shall be equipped with suitable captive fastenings and shall be of a size that can be conveniently handled by one man.



A4-11

CE/416/NPCIL/24VDC/TR

REV 00

PAGE 13 OF 20

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Enclosure shall conform to protection class of IP-41. Panels shall be provided with removable lifting hooks on the top for handling. Suitable base channels (ISMC) of 100mm height shall be provided for anchoring to the floor. DCPS shall be suitable for top cable entry.

6.8.6 Ground Bus

Safety Ground Bus Bar

A safety ground bus bar of bare copper with 150 sq. mm minimum cross section shall be provided to run along the panel at the bottom. Bus bar shall be permanently brazed to the sheet steel frame work. All sub assemblies and non current carrying metal parts like doors etc shall be connected to this safety ground bus bar. Bus bar shall be accessible at both ends for connection to the station ground system. A crimp type copper lug of size 4 /0 AWG shall be provided at the end of safety ground bus bar. The safety ground bus bar shall have tapped holes at regular intervals along its length to enable cable termination of grounding wires from individual devices. A 15mm diameter hole is to be provided at each end of the bus bar. All metallic cases / modules shall be connected to the electrical earth by independent copper wire of size not less than 4 sq. mm. The colour of grounding wires shall be green. Grounding wires shall be connected on devices With suitable clamps and soldering is not permitted.

Signal Ground Bus Bar

Each cabinet shall be provided with 25mm x 6mm thick electrolytic copper bus bar conforming to IS-1897. The bus bar shall be of Electrolytic Tough Pitch (ETP) or Fire Refined High Conductivity (FRHC) grade. The signal ground bus bar shall have holes drilled at regular intervals to terminate the signal ground wire. The safety ground bus bar shall be suitably isolated from the main frame. Necessary terminal clamps and connectors for this purpose shall be in the scope of supplier.

6.8.7 Enclosure ventilation and illumination:

Enclosure shall be fan cooled, for better heat dissipation and to allow a reduced size of cubicles. Arrangement shall be provided to circulate the air homogeneously throughout the compartment. Louvers provided for ventilation shall be located in the compartment doors and bolt-on panels. The louvers shall be suitably screened or fitted to prevent entrance of vermin etc. Fan failure alarm and indication shall be provided for monitoring the healthiness of fans. Flapper circuit design shall not be used for monitoring of fan failure. The DCPS shall be able to operate satisfactorily even after failure of cooling fan for about 8 hrs on full load. All the materials used for construction shall be such that they will not independently support combustion. Round compact fluorescent lamp of 20 watts, 240V AC, 1 Ph shall be provided with door switch. Thermostatically controlled Space heater and 3pin 5A receptacle with plug shall be provided in each charger panel.

6.8.8 Cabling (APPLICABLE FOR BOTH MAIN & STANDBY CHARGER):

6.8.8.1 Cable supports and arrangements:

Cable entry shall be from top. Suitable termination arrangements and support shall be provided inside the DCPS. Suitable termination arrangements shall be provided including cable lugs, glands and supports inside the DCPS. The cable lugs shall be of the crimping type. All internal power wiring shall have crimped lug termination.

6.8.8.2 Bus Bars:

Hylum barriers shall be provided between bus bars of opposite polarity. Adequate space shall be given for maintenance. Cu Bus Bar of suitable rating for connecting Charger to DCDB shall be provided ensuring negligible voltage drop.



A4-11

CE/416/NPCIL/24VDC/TR

REV 00

PAGE 14 OF 20

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6.8.9 Terminal blocks and small wiring:

Wiring of electronic circuits shall be 250 volt grade 1.5 sqmm minimum. Wiring between terminals of various devices shall be point to point (no wire splitting or Connections with wires trunked). It shall be so arranged that instruments or devices may be removed and/or services without unduly disturbing the wiring. Each wire shall be identified at both ends with wire numbers corresponding to the numbers shown in the supplier's drawings. Wire marks used shall be non-deteriorating type. All control wiring shall be adequately segregated and protected from fault.

Provisions shall be made for grounding voltage and current transformer neutrals where required. Wiring affected by stray electromagnetic fields shall be suitably shielded or run as twisted pairs wherever applicable

Terminal blocks shall be grouped by services and segregated according to circuit voltage and field designation. Where schematic diagrams show more than one wire to be connected to any wiring point, a sufficient number of terminals jumper together shall be provided to allow any one wire per terminal on the outgoing side of the terminal block. 20% spare terminals, suitably distributed shall be provided. Connections to terminal blocks shall be easily removable for testing purposes.

The cabinet shall be provided with two nos. suitably located grounding terminals to connect 4/0 AWG copper ground conductor. Each terminal shall comprise of two bolt drilling with M10 GI bolts and nuts to receive grounding connection. All non-current carrying metal parts shall be ended to a ground bus of copper.

6.8.10 PAINTING

6.8.10.1 Painting procedure: On completion of fabrication, all steel work shall undergo following process


- a) Pre-treatment by seven tank process.
- b) Under Coat and painting.

6.8.10.2 Pretreatment. by seven tank process: Heavy deposits of grease, oil and rust shall be removed manually.

- **Degreasing:** Surface cleaning to remove oil, grease, dirt and swerve from assemblies shall be done by either of following methods:
 - a) Trichloroethylene cleaning as per clause 7.120 of IS:6005 OR
 - b) Alkaline cleaning as per clause 7.1.3 of IS-6005.
- **Derusting:** Rust may be present after degreasing owing to exposure' to corrosive conditions during manufacture. Scale may be present from operations during manufacture. It is therefore, necessary that rust be removed before application of phosphate treatment.

Derusting shall be done by chemical treatment method as per clause no. 8.1.2 of IS-6005. Manufacturer may adopt either of the following methods:

 - a) Sulfuric or hydrochloric acid pickling as per clause no. 8.1 .2.1 of IS.6005 OR
 - a) Phosphoric acid pickling as .per IS·6005.
 - b) Duplex sulfuric and phosphoric acid process as per clause no. 8.1 .2.3 of IS·6005

		 A4-11		CE/416/NPCIL/24VDC/TR
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A4-11

CE/416/NPCIL/24VDC/TR

REV 00

PAGE 16 OF 20

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6.8.12 Mimic Diagram:

Mimic Diagram made of anodized aluminum or plastic material which can be easily cleaned shall be provided on the panel. It shall be fixed by screws.

6.9 Tropicalization: The supplier shall provide details of his intentions with regard to tropicalisation, including details of any special features for the following items:

- Transfonners
- Relays
- Wiring
- Terminals
- Rectifiers
- Controller Thyristor
- Contactors

6.10 EMC Testing: The 24V DC main battery charger shall be tested for Electromagnetic Compatibility as per PC-E-710 on “Electromagnetic compatibility qualification of C&I equipment”.

7.0 INSPECTION TEST & REPORT

2.17.1 Quality Surveillance & Inspection:

The vendor shall allow access to the M/s NPCIL or his authorised representative at all reasonable time, during manufacture, assembly, testing and inspection to premises in which work is being carried out. The supplier shall provide all the testing and inspection services and facilities as required. Supplier's shop inspection shall be under the control of a competent Chief Inspector who primacy responsibility is inspection reporting directly to Management.

The inspection shall be carried out in a manner satisfactorily and shall be subject to approval by the Purchaser. A Quality Assurance Plan (QAP) is enclosed in Annexure to this specification. Vendor shall prepare QAP based on the QAP enclosed herewith and submit to purchaser for approval.

Manufacturer shall carry out all inspection and tests, apart from that all work covered by this specification shall be subject to quality surveillance by the NPCIL/BHEL or his authorized representative. Quality Surveillance by the Purchase or his authorized representative shall not relieve the supplier of the inspection duties called herein. In addition to the tests performed by the supplier, the purchaser shall have the right to ask for additional inspection or testing as deemed necessary and the additional cost of such tests will be borne by the NPCIL.

In the event of any failure to meet the inspection or test requirements specified herein, the supplier shall notify NPCIL/BHEL or their authorised representative. The supplier must obtain permission from the purchaser before repair is undertaken. If repairs, including redesign, are likely to affect the results of tests previously completed, appropriate re-inspection and re-testing shall be carried out .The quality control procedure to be followed to ensure a satisfactory repair shall be subject to approval by Purchaser.

The supplier shall provide NPCIL/BHEL or their representative with complete set of detailed drawing which will be used by them to assist in the inspection during construction of the equipments and which will be returned after the completion of the contract. Inspection shall not be limited to the end product only. Facilities shall be provided for inspection during various stages of manufacture and as agreed between the supplier and the purchaser.



A4-11

CE/416/NPCIL/24VDC/TR

REV 00

PAGE 17 OF 20

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If there are changes in the components or design/type already type tested and design type offered against this specification, the purchaser reserves the right to demand repetition of tests without any extra cost before commencement of supply. The bidder shall bring out in his offer all such changes made in components, materials, design etc. as the case may be and likely affects of such changes on type qualification

8.0 TESTS

The supplier shall carryout tests to show that the equipment has been satisfactorily designed and manufactured and will perform to the standards required by this specification. If some tests mentioned cannot be carried out at supplier's works the same shall be carried out at site. In such a case, the supplier shall indicate the procedure of the test. If the equipment does not pass the test, it will be the supplier's responsibility to bring the equipment to the guaranteed figure or replace the faulty equipment at his cost. Any special equipment required for testing, like meters or relays, etc. if not available at purchaser's site office shall be supplied by the supplier.

8.1 Component Testing:

All semiconductors and other discrete components to be used in the DCPS shall be screened. These shall be procured from reputed manufacturer with certificate of compliance to recent relevant specifications. Component testing shall be done as per MIL standard-883C. Active component like ICs, transistors, diodes shall be subjected to baking at maximum storage temperature for 24 hours. Then the component shall be subjected to temperature cycles between minimum storage temperature and maximum storage temperature for 10 cycles. Duration of each cycle shall be 15 minutes. Transition time from one cycle to another shall be 5 minutes. After the temperature cycling functional testing shall be done on 100% active component

Passive components like resistors, capacitors, relays, control transformer shall be subjected to baking and temperature cycling as above. However functional testing shall be done on sample basis for passive components. Details of the test to be conducted shall be listed in "Quality Assurance Plan" to be submitted by the vendor after award of contract. The components to be tested are shown below. Suppliers shall list all the components used and not necessarily only the components listed below.

List of Components to be tested:

- | | |
|-----------------------------|---|
| (i) Electrolytic Capacitors | (ii) Diode |
| (iii) Circuit Breaker | (iv) Contactors |
| (v) Switches | (vi) Meters |
| (vii) Control Transformers | (viii) Fan Supply transformers |
| (ix) Input transformers | (x) DC filter choke |
| (xi) PCBs | (xii) Current transformers |
| (xiii) Shunt | (xiv) Temperature sensor |
| (xv) Control cables | (xvi) Power cables |
| (xvii) DC filter assembly | (xviii) Surge and lightning suppressors |
| (xix) Rectifier assembly | (xx) Fuses |

8.2 Routine tests on system:

Following test shall be conducted on the complete DCPS as per IEC-146 wherever applicable. Five bound volumes containing copies of these test reports shall be submitted to the NPCIL. Shipping release will be issued only after receipt of three bound volume of test reports. Supplier shall keep a record for a period of five years after completing the job.



A4-11

CE/416/NPCIL/24VDC/TR

REV 00

PAGE 18 OF 20

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1. Visual inspection for quality of workmanship, finish, dimensional checks & degree of protection.
2. Verification of compliance with approved drawings including checking of BOM & wiring.
3. Connection checking & overall dimension checking of modules, bins and panels.
4. All interlocks and sequence operation of circuits such as indications on front panel, alarms and trips shall be shown.
5. Voltage regulation of rectifier for input voltage variation at 415V (-) 10% / 415V (+) 10%.
6. Undershoot & overshoot voltage of rectifier output when 100% load is switched on & off.
7. Overload capability
8. Insulation resistance test.
9. High Voltage test
10. Input in-rush current measurement when DCPS is switched on at rated load.
11. Battery current limiting feature and V-I characteristics of the charger.
12. Test for diode voltage regulator operation
13. Short circuit capability test by connecting 100% load to DCPS & than short circuiting output.
14. Burn in test: DCPS shall be kept on load continuous for a period of 100 hours at nominal input voltage and full output load. Various functional tests mentioned above shall be carried out after burn in test. Burn in test and above functional test shall be conducted on all equipment.
15. Tests to prove functional requirements. Variation of voltages and current limit set values for all modes of charging and checking of accuracy for above settings.
16. Mechanical operation tests on switches, auxiliary electrical and mechanical devices.
17. Checking of equipment overall current limit operation.
18. Electrical control interlock and sequential operation tests
19. Insulation resistance test at 500V DC.
20. High Voltage test at 2000V AC RMS for one minute.
21. Functional tests on auxiliary devices.
22. Alternating current measurements on the input side in all phases at full load and no load including power factor, wave shape and harmonics injected to the system.
23. Measurement of losses and efficiency at full load, 50% and 25% of load rated input/output voltages.
24. Ripple content of DC output at maximum and minimum DC bus voltage and charging conditions under specified input voltage range.
25. All alarms and trips to be checked for satisfactory operation at various loads from zero to full load including specified over load.
26. Priority logic test on integrated set of DCPS for transfer of standby to main DCPS.
27. Noise Level test (max. 75 dB) at 1.5m distance from DCPS.
28. Efficiency of DCPS at full load and rated input / output voltages.
29. Voltage regulation of rectifier for input voltage variation at $415V \pm 10\%$
30. Ripple content of rectifier output at float voltage & boost voltage.
31. Undershoot and overshoot voltage of rectifier output when 100% load is switched on and 80% load switched off.
32. Battery charging test at boost voltage.
33. Power Factor measurement with 3 Phase PF meter at full load and at rated input voltage.

8.3 Special type test

8.3.1 Environmental Tests

Typical sub assemblies of one DCPS shall undergo environmental testing as mentioned below..

Dry heat test for PCB & sub assembly

Dry heat test as per IS-9000 Part III/Section: 3 test must be conducted at conditions mentioned:

Temperature: $55 \pm 2^{\circ}\text{C}$

Relative Humidity: 50% at 35°C

Duration: 4 hours.



A4-11

CE/416/KAPP 3 & 424VDC/TR

REV 00

PAGE 19 OF 20

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Damp heat test (cyclic) for PCB & sub assembly

Damp heat (cyclic) test as per IS-9000 Part V/ Section 2
Test must be conducted at the conditions mentioned below:

Upper Temperature: 40 + 2 °C
Relative Humidity : 90% (minimum)
Lower Temperature: 25 + 3 °C, 98% RH
Relative Humidity : 95% (minimum)
Each cycle is of 12 hours + 12 hours duration
Number of cycles: 2

8.3.2 Temperature rise test by connecting 100% load to DCPS and recording temperature rise by mounting sensors on transformers, choke, SCR heat sink and diode heat sink at 24V DC & 31.2V DC with doors closed.

8.3.3 EMC test

EMC test shall be conducted on one DCPS.

8.3.4 Preparation and submission of documentation covering reliability analysis, stress analysis, identification of age related and non age related degraded components as per IEEE-650.

8.3.5 Performance of stress test as per IEEE-650.

8.3.6 Branch circuit MCB clearance test: The DCPS shall be loaded at rated load at the output. The DCPS shall be capable of isolating a short circuit in branch circuit through a MCB of 20A, 'C2' curve without tripping the DCPS.

8.4 Test Certificates

8.4.1 All routine and type test certificates including records, performance curves etc. shall be supplied according to the distribution schedule.

8.4.2 The Supplier shall ensure that instruments and gauges to be used for testing and inspection have rated calibration and the accuracy can be traced to National / International Standards. CPS shall be kept on load continuous for a period of 100 hours at nominal input voltage & full output load.

8.5 Tests to be carried out at site

The following tests shall be conducted at site on DCPS as per standards specified. These are however not intended to form a comprehensive commissioning check list as it shall be the Supplier's responsibility to draw up and carryout such a programme after obtaining the Purchaser's approval.

Following typical checks to be carried out at site:

8.5.1 Preliminary Checks

- Check name plate details of all associated equipment according to specification.
- Check for physical damage.
- Check tightness of all bolts, clamps and connecting terminals.
- Check cleanliness.
- Check earthing.
- Check for Lamps, Sockets etc.
- Check for general layout.
- Check provision of all protective relays, meters and transducers as per drawing.
- Check for proper mounting of power devices like thyristors, Diodes etc. on heat sinks.



A4-11

CE/416/KAPP 3 & 424VDC/TR

REV 00

PAGE 20 OF 20

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8.5.2 Commissioning Checks

- a. Each wire shall be traced by continuity tests and it should be made sure that the wiring is as per relevant drawings. All interconnection between panels / equipment shall be similarly checked.
- b. All the wired terminals shall be meggered to earth.
- c. Megger test between bus bars and bus bars to earth.
- d. Settings of relays, MCCBs, other alarms tripping devices and interlocks as per scheme.
- e. Functional checking of all control circuits including float, equalise and boost conditions, metering and relay circuits.
- f. Insulation resistance test of all circuits.
- g. Measurement of voltage regulation.
- h. No load current and voltage (AC) and voltage and current (both AC. and DC.) at different loads.
- i. Measurement of harmonics injected in to the system for different loading conditions.
- j. Measurements of output voltage ripple contents.
- k. Checking of battery current limit setting and verification of rectifier control circuitry under various conditions of operation.
- l. Test for diode voltage regulator operation.
- m. Priority logic test on integrated set of DCPS for transfer of standby to main DCPS.
- n. All interlocks and sequence operation of circuits such as indications on front panel, alarms and trips shall be shown.
- o. Functional tests on rectifiers control circuitry.

9.0 PACKING AND SHIPMENT:

The DCPS shall be so packed as not to suffer deterioration damage or breakage during shipment. Packing should be such that the ingress of moisture, dirt and other foreign material can be avoided. Packing method shall be adequate to withstand a period in transit for more two months and storage at site under tropical climate for minimum period of one year without suffering any damage or deterioration. Each package shall be properly labeled to indicate the type and quantity of material it contains, purchase order number, dimensions, weight and any other necessary data to identify the equipment and relate it to the contract. All bolts, nuts, plates, and other small parts shall be shipped in separate boxes. All projecting connections shall be adequately blocked and protected to prevent damage during shipment. The packing of panel may preferably be done using suitable thickness of plywood

10.0 INFORMATION REQUIRED WITH THE BID

The bidders shall submit all supporting information and technical data/drawings requested in this specification to permit the evaluating engineer to make a detailed comparison and evaluation of the tenders without the need of the request for further information from the bidder.

Bids which are not consisting of the essential information as mentioned below will not be considered.

1. Annexure-A gives the formats for submission of the technical bid. These annexure shall be filled in fully and shall make the essential part of the proposal of the bidders.
2. The bidder shall submit a brief list of work executed by him to standards and requirements specified in the tender document.
3. The supplier must state the mode of transportation whether by rail or by truck, and what measures will be taken to ensure that the equipment will not be damaged in transit.



A4-10

CE/416/NPCIL/24VDC/SOS

REV 00

PAGE 01 OF 08

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TECHNICAL SPECIFICATION OF DCDB

REVISION: 00

APPROVED

RAJASEKAR K

PREPARED

AMIT KR SHARMA

ISSUED

416

DATE

28 / 8 / 15



A4-11

CE/416/NPCIL/24VDC/TR

REV 00

PAGE 02 OF 08

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1.0 SCOPE

The scope of this specification covers the design, manufacture, testing, guarantee, supply, delivery and commissioning of DCDB.

2.0 CONTENTS : Requirements of this specification are resented under following section headings:

Description	Section
Applicable standards, specifications and drawings.	3
Materials and workmanship.	4
General functions and description.	5
Design requirements.	6
Inspection and reports	7
Tests	8
Packing and Shipment	9
Information required with the bid	10
Technical particulars required with the BID	Annexure – E
Quality Assurance Plan (Sample)	Annexure – F

3.0 APPLICABLE STANDARDS, SPECIFICATIONS AND DRAWINGS

All documents listed below constitute a part of this specification. In the event that certain requirements of specifications, drawings or data listed below conflict with the requirements of specification, the requirements of this specification shall govern.

3.1 Applicable Standards

IS-5578	Guide for marking of insulated conductors.
IS-8573	Digital DC voltmeters and DC electronic analogue to digital converters
IS/IEC-60898	Electrical Accessories - Circuit-Breakers for Over current Protection for Household and Similar Installations
IS-694	PVC Insulated cables for working voltages upto and including 1100 V
IS-1248	Direct acting electrical indicating instruments
IS-13703 IS-5553	HRC cartridge fuse links up to 650V Reactor
IS-2628	Rotary wafer switches
IS-8872 Part – 1	Non wire wound variable resistors (potentiometers)
IS-3156	Voltage transformers
IS-8909	Wire wound resistors
IS-3961	Recommended current ratings for cables
IS-4007	Terminals for electronic equipment
IS/IEC-60947-3	Heavy duty air break switches and composite units of air break switches and fuses for voltages not exceeding 1000V AC or 1500V DC.
IS-14901	Methods of measurement on semiconductor devices
IS-4540	Monocrystalline semiconductor assemblies and equipment
IS-5469	Code of practice for use of semiconductor function devices
IS/IEC-60947-1	General requirements for switchgear and control gear for voltage not exceeding 1000V.
IS/IEC-60947-2	Moulded case circuit breakers Relays Transistor Capacitor
IS-5051	Relay
IS-14901	Thyristors
IS-590	Capacitor
IS-5	Colours for Ready Mixed Paints and Enamels.



A4-11

CE/416/NPCIL/24VDC/TR

REV 00

PAGE 03 OF 08

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IS-9000-Part-III	Basic environmental testing procedure for electronic and electrical items: Dry heat test.
IS-9000-Part-IV	Basic environmental testing procedure for electronic and electrical items: Damp heat (cyclic) test.
IS-4000	High strength bolts and steel structures.
IS-737	Wrought aluminum and aluminum alloy sheets and strips for general engineering purposes.
IEEE-344	Recommended practices for seismic qualification of Class 1E equipment for Nuclear Power Generating Stations.
MIL-STD-285	Attenuation measurements for enclosures, Electromagnetic shielding for electronic test purposes
IEEE-299	IEEE standard method for measuring the effectiveness of electromagnetic shielding enclosures.
IEC-61000-5-7-2001	Installation and mitigation guidelines- Degrees of protection provided by enclosures against electronic disturbances (EM code) (10KHz to 40GHz).

3.2 Applicable Specifications

PC-E-249	Technical specification for ground fault detection system.
PC-E-248	Technical specification for MCB status monitoring system.
PC-E-410	Technical specification for screw clamp type and screw less spring clamp type terminal blocks and accessories for non radiation area.
PP-E-2061	Specifications for requirements of components /equipment for instrumentation items.
PC-E-793	Guidelines for Derating of electronic components
PC-E-710	Engineering Standard for Electromagnetic Compatibility Qualification of C&I Equipment

5.0 GENERAL FUNCTION AND DESCRIPTION

5.1 Function of class I 24V DCDB panel is to distribute 24V DC to DDCMIS panels, to supply flasher power to indicating lamps, to detect the ground fault as well as to monitor the status of all Miniature Circuit Breakers (MCBs) mounted in these power supply distribution panels.

Technical requirements of MCB, Moulded Case Circuit Breaker (MCCB), handswitches, indicating meter and indicating lamps mounted in various MCCPSD panels are given in section no. 6.6 of this specification.

Technical requirements of the ground fault detection system are covered in NPCIL specification no. PC-E-249.

Technical requirements of the MCB Status Monitoring System (MCB SMS) are covered in NPCIL specification no. PC-E-248. Each panel shall house the Local Control Module (LCM) and auxiliary contact of each MCB shall be wired to LCM of MCB SMS. MCCPSD shall be able to work satisfactorily under the environmental conditions mentioned in earlier sections of charger.

5.2 Description of 24V DCDB Panels

24V DC Main buses shall be provided with green indicating lamps and shall be equipped with Earth Fault Sensor (EFS). Scanner shall be provided for monitoring the EFSs. Insulation monitoring device and Scanner shall be provided with common hand switch for temporary isolation. 24V DC buses should be equipped with 2 pole Moulded Case Circuit Breakers (MCCB) rated as per suitable charger rating (refer feeder list). Miniature circuit breakers (MCBs) of various ratings (as mentioned in feeder list) shall be mounted in DCDB panel. All the sub-buses (if any) shall be provided with "no voltage" relays. Contacts of these no voltage relays initiate no voltage alarm in control room thru DCS system.



A4-11

CE/416/NPCIL/24VDC/TR

REV 00

PAGE 04 OF 08

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6.6 Equipment

6.6.1 Miniature Circuit Breakers

a. Sub-bus Miniature Circuit Breakers (MCB): 24V DC miniature circuit breakers shall be of 2 poles. They shall have one change over auxiliary contact rated for 0.5 A at 24V DC. These MCBs supply power to mixed loads such as relays, lamps and solenoid valves. Therefore, tripping characteristics shall be of medium delay (C characteristic). MCBs shall have breaking capacity of 1 KA. MCBs shall be fitted with mechanical „ON“ and „OFF“ indicators. MCB shall be generally as per IS/IEC-60898. Insulation resistance shall be more than 100 mega ohms at 500V DC.

b. Bus Circuit Breakers (CB): 24V DC moulded case circuit breakers (MCCB) shall be 2 pole without any auxiliary contact. Tripping characteristic shall be of medium delay („C“ characteristic). MCCB shall have breaking capacity of 5 KA. CBs shall be fitted with mechanical „ON“ and „OFF“ indicators. MCCBs shall be generally as per IS/IEC-60947-2. Tripping characteristics of these bus MCCBs shall be coordinated such that the down stream MCBs shall trip upon occurrence of fault at down stream with out affecting these bus MCCBs. Also the up stream MCCBs shall be of higher rating to prevent them from tripping before these bus MCCBs trip. Insulation resistance shall be more than 100 mega ohms at 500V DC.

6.6.2 Hand Switches : Hand switches shall be 2 A rated at 24V DC.

6.6.3 Indicating Meters All meters shall be LED 7 segment digital type of size approximately 48 x 96 mm and shall be suitable for flush mounting. Zero adjustment shall be possible from front side. Meters for AC voltage, DC current measurement shall be 4 and ½ digits while meters for AC current and DC voltage shall be 3 and ½ digits. Accuracy of meters shall be 1% full scale or better. All voltage circuits of meters shall have fuses. Meters shall comply IS: 8573.

6.6.4 Indicating Lamps Indicating lamps shall be LED assemblies and of low voltage type. Series resistors / rectifiers for DC / AC may be fitted if required.

6.6.5 Bus Bars Bus bars shall be of electrolytic grade copper and shall have continuous current carrying capacity of suitable for charger rating specified in feeder list. Bus bars shall be rigidly braced to withstand the fault currents. Bus bar and link joints shall be made as per the latest modern practice. All joints as far as possible shall be bolted type. Supports used for the bus bars shall have adequate thickness and strength to withstand thermal, electrical and mechanical stresses during short circuits and they should be suitable for terminating cable of size as specified in feeder list. Bus bars for terminating incoming cables shall be placed horizontally. Marking and arrangement of bus bars shall conform to IS: 5578. Temperature at any point on the bus bar shall not exceed 85DegC during continuous operation at rated current at 45Deg C ambient.

6.6.6 Control Equipment

6.6.6.1 Semi-conductors: Refer charger specification section cl 6.5.2


6.6.6.2 Control Fuses : All control fuses for the protection shall be slow blow type Category 1A long life grade suitable for 85Deg C operation.


6.6.6.3 Capacitors : Preferably all capacitors shall be tantalum.

6.6.6.4 Terminal Blocks: Terminal blocks shall be of Polyamide (nylon 6.6) and brass clamping yoke. Fire rating shall be V0 as per UL-94. Current bar shall be of copper alloy.

6.6.6.5 Resistors

All resistors shall be preferably metal oxide type and in general shall not be rated more than 50% of the manufacturer’s rating. Potentiometer shall be used wherever wide range voltage and current adjustments are necessary.

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				REV 00
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				<p>6.6.6.5 Resistors All resistors shall be preferably metal oxide type and in general shall not be rated more than 50% of the manufacturer's rating. Potentiometer shall be used wherever wide range voltage and current adjustments are necessary.</p> <p>6.6.6.6 Relays All relays shall be compact, sealed to provide maximum reliability and shall be free from contact deterioration. Relays shall have 2 C/O contacts. The rating of contact for shall be 2 A. All relays shall be instantaneous and plug in type.</p> <p>6.6.6.7 Monitor Points: Monitor points shall be provided for rapid fault finding.</p> <p>6.6.7 Printed Circuit Boards: Refer charger specification section cl 6.8.4.</p> <p>6.6.8 Ground Fault Detection: Ground fault detection shall be as per specification no. PC-E-249. The supplier shall mount the GFD system suitably on the panels, wire and integrate with main charger panels and ensure proper functions of the GFD system.</p> <p>6.6.10.3 Housing and Foundation : In its proposed location, panel shall have access from its front as well as rear. Suitable gland plates of minimum 2.5 mm thickness shall be provided for cable entry. Cable entry shall be from bottom of the panel. Refer charger specification section 6.8.5</p> <p>6.6.10.4 Compartment doors and barriers Barrier between compartments shall be designed such that it is not possible to accidentally touch live parts in adjacent compartment while working on equipment in a particular compartment. All doors shall be provided with good quality industrial locks and handles. Hinges shall be concealed type. Doors shall be provided with sponge gaskets for effective dust proofing. Doors shall open only 90 degree. All locks of doors of panels shall have a common key.</p> <p>6.6.10.5 Enclosure ventilation and illumination Enclosure shall be natural cooled for heat dissipation. Refer charger specification section cl 6.8.7</p> <p>6.6.10.6 Cable supports and arrangements Cable entry shall be from bottom. Suitable termination arrangements shall be provided including cable lugs and supports inside the CCPSD panels. The cable lugs shall be of the crimping type tinned copper. All internal power wiring shall have crimped lug termination. Mounting boards for various control circuits and sub assemblies shall be of adequate thickness to withstand electrical and mechanical stress and vibration.</p> <p>6.6.10.7 Wiring and Terminations a. Wire: All small wires shall be stranded copper conductor PTFE insulated, run in plastic wiring channel. Small wiring including instrument transformer secondary wiring shall be 2.5 sq. mm minimum and shall be supplied in accordance with specifications and rating of the charger. Wire size for electronic control shall suit the electronic components used. Wiring affected by stray electromagnetic fields shall be suitably shielded. b. Terminal Blocks: Terminal blocks shall be screw type. Terminal blocks connected with MCBs of 6A and below shall be 4 sq. mm. TBs connected with 10A, 15A circuit breakers shall be 25 sq. mm. for circuit breakers of 25A and above terminals of 35 sq. mm size shall be provided to terminate the cables. For other control circuits 4 sq. mm TBs shall be used. TBs shall be suitably mounted to allow easy access. TBs shall be grouped by services and segregated according to circuit voltage and field destination. 20% spare terminals suitably distributed shall be provided. Connection to TBs shall be easily removable for testing purposes. TBs shall be mounted not less than 250mm below the top cover.</p>

			CE/416/NPCIL/24VDC/TR
			REV 00
			PAGE 06 OF 08
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A4-11

CE/416/NPCIL/24VDC/TR

REV 00

PAGE 07 OF 08

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6.11.3 Sub-Contractors: Normally supplier shall not sub-contract any or all of the work involved in execution of the system. In exceptional cases, supplier shall take written permission from the Purchaser for sub-contracting. Supplier shall be responsible to the purchaser for all work of any sub-contractor allowed by the purchaser.

7.0 INSPECTION & REPORTS : Refer charger specification section 7.0

8.0 TESTS

The manufacturer shall carryout tests to show that the equipment has been satisfactorily designed and manufactured and performs to the standards required by this specification. If some tests mentioned cannot be carried out at supplier's works, the same shall be carried out at site. In such a case, the supplier shall indicate the procedure of the test. If the equipment does not pass the test, it shall be the supplier's responsibility at his cost. Any special equipment required for testing, like meters or relays, etc. if not available at purchaser's site office shall be supplied by the supplier.

8.1 Component Testing All components/equipment/sub-assemblies to be used in Main Control Centre Power Supply Distribution (MCCPSD) panels shall be subjected to visual, mechanical, electrical and functional tests. The test results shall be documented and submitted to customer QA engineer for review. Details of the tests to be conducted shall be listed in Quality Assurance Plan to be submitted by the supplier based on enclosed sample QAP after award of contract. The components to be tested are shown below. Supplier shall test all the components/equipment/sub-assemblies used and not necessarily only the components listed below.

List of Components to be tested

1. Indicating lamps
2. Circuit breakers
3. Hand switches
4. Fuses
5. Volt meters
6. Ammeters
7. Cables
8. PTFE wires
9. Miniature circuit breakers
10. Flasher circuit
- 10.1 Resistors
- 10.2 Capacitors
- 10.3Relays 10.4PCB 10.5Semiconductor components & ICs
11. Insulation Monitoring Device(IMD)
12. Scanner
13. Earth Fault Sensor(EFS)
14. MCB Status Central Processing and Display(MSCPD)
15. Local Control Module(LCM)
16. MCB Status Remote Display(MSRD)

8.2 Tests on complete system The following tests shall be conducted on the complete Main Control Centre Power Supply distribution (MCCPSD) panels:



A4-11

CE/416/NPCIL/24VDC/TR

REV 00

PAGE 08 OF 08

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8.2.1 Routine Tests

1. Connection checking & overall dimension checking.
2. Insulation resistance test on complete panel.
3. High Voltage test on complete panel.
4. Indications & alarm function.
5. Operation of no voltage test.
6. Ground fault detection system as per specification no. PC-E-249.
7. MCB status monitoring system as per specification no. PC-E-248.
8. Flasher Unit as per NPCIL approved test procedure

8.2.2 Acceptance Test

- 8.2.2.1 Connection checking and overall dimension checking.
- 8.2.2.2 Insulation test on complete panel.
- 8.2.2.3 High voltage test on complete panel.
- 8.2.2.4 Indication & alarm contact function.
- 8.2.2.5 Ground fault detection system as per specification no. PC-E-249
- 8.2.2.6 MCB status monitoring system as per specification no. PC-E-248
- 8.2.2.7 Flasher Unit as per NPCIL approved test procedure.
- 8.2.2.8 Functional test on panels

8.2.3 Special type tests: Environmental Tests- Refer specification of charger section 8.3

8.2.4 Test Certificates 8.2.4.1 All routine and type test certificates including records, performance curves etc. shall be supplied according to the distribution schedule.

8.2.4.2 The Supplier shall ensure that instruments and gauges to be used for testing and inspection have rated calibration and the accuracy can be traced to National / International Standards.

8.2.5 Tests to be carried out at site The following tests shall be conducted at site on MCCPSD panels as per standards specified. These are however not intended to form a comprehensive commissioning check list as it shall be the Supplier's responsibility to draw up and carryout such a programme after obtaining the Purchaser's approval. Following typical checks to be carried out at site:

8.2.5.1 Preliminary Checks

- a. Check name plate details of all associated equipment according to specification.
- b. Check for physical damage.
- c. Check tightness of all bolts, clamps and connecting terminals.
- d. Check cleanliness.
- e. Check earthing.
- f. Check for Lamps, Sockets etc.
- g. Check for general layout.
- h. Check provision of all MCBs, MCCBs, relays, meters, GFD devices, MCB SMS devices etc. as per drawing.

8.2.5.2 Commissioning Checks

- a. Each wire shall be traced by continuity tests and it should be made sure that the wiring is as per relevant drawings. All interconnection between panels / equipment shall be similarly checked.
- b. All the wired terminals shall be meggered to earth. c. Megger test between bus bars and bus bars to earth. d. Settings of relays, MCBs, other alarms tripping devices and interlocks as per scheme. e. Functional checking of all control circuits including metering and relay circuits. f. Insulation resistance test of all circuits. g. Functioning of GFD and MCB SMS.

9.0 PACKING AND SHIPMENT: Refer charger specification section 9.0

			CE/416/NPCIL/24VDC		
			REV	00	
			PAGE	01	
			OF	01	
<p style="writing-mode: vertical-rl; transform: rotate(180deg);"> COPY RIGHT AND CONFIDENTIAL THE INFORMATION ON THIS DOCUMENT IS THE PROPERTY OF BHARAT HEAVY ELECTRICALS LIMITED. IT MUST NOT BE USED DIRECTLY OR INDIRECTLY IN ANY WAY DETRIMENTAL TO THE INTEREST OF THE COMPANY. </p>	<p>ANNEXURE-A</p> <p>TECHNICAL COMPLIANCE SHEET FOR CHARGER TO BE FILLED BY PARTICIPATING VENDORS AND SUBMITTED ALONG WITH TECHNICAL BID</p>				
		REVISION: 00	APPROVED  RAJASEKAR K		
		PREPARED  AMIT KR SHARMA	ISSUED 416	DATE 28 / 8 / 15	

ANNEXURE – A

TECHNICAL PARTICULARS REQUIRED WITH THE BID

1.0 TECHNICAL DATA TO BE SUPPLIED ALONGWITH THE TENDER

Bidders shall submit with their bids a complete description of all equipment on which their bid is based and such description shall include the details given hereunder. It is necessary that all details shall be completely filled in the first instance to evaluate the bid and compare it with other offers.

Bids with incomplete or ambiguous information shall not be considered.

The details hereunder shall be completed in all respects and reference to other places shall be avoided as far as possible.

All ratings indicated by the bidder shall be at specified ambient conditions.

1.1 Complete Equipment		
1.1.1 Manufacturer's Name	-----	-----
1.1.2 Type reference	-----	-----
1.1.3 Nominal Ratings	-----	-----
1.1.3.1 Input voltage	-----	-----
1.1.3.2 Output voltage	-----	-----
1.1.3.3 Output current	-----	-----
1.1.4 Output DC Voltage Range	-----	-----
1.1.5 Output voltage regulation at 2.2V DC float & boost voltage at 2.4V DC per cell respectively.	-----	-----

1.1.5.1	Steady state	-----
1.1.5.2	Transient state variation for sudden application and removal of 100% load.	-----
1.1.6	Recovery time of voltage from transient condition to rated voltage	-----
1.1.7	Ripple content in DC output for full load at nominal input/output voltage with battery disconnected.	-----
1.1.8	Efficiency at full load and nominal input/output voltage	-----
1.1.9	Boost charging current limit adjustable range	Yes/No
1.1.10	Equalize charging current limit adjustable range	Yes/No
1.1.11	Is diode voltage regulator as Per section no. 6.2.1 provided?	-----
1.1.12	Harmonics injected into mains because of DCPS	-----
1.1.13	Power factor at the input of charger.	-----
1.1.14	Is cable entry from top?	-----
1.1.15	Weight of complete DCPS	-----
1.1.16	Overall size of DCPS	-----
	Width x depth x height (in mm)	-----

- 1.1.17 Ambient temperature and humidity at which DCPS can operate satisfactorily. -----
- 1.1.18 Method of cooling Natural or Forced :
- 1.1.19 a) Whether details of painting procedure and painting tests are enclosed? Yes/No
- 1.1.20 b) Colour of finish paint
- Outside -----
- Inside -----
- 1.1.21 Noise level of DCPS -----
- 1.1.22 Short time current withstand rating at D.C. output. -----
- 1.1.23 Standard power frequency insulation withstand for one minute. -----
- 1.1.24a) Mean time between failure of Complete equipment. -----
- b) Device having lowest MTBF. -----
- 1.1.25 Earth Bar
- Is it made of copper and 150 Sq. mm? Yes/No
- 1.1.26 Can the electronic components be subjected to burn in test before use? Yes/No

1.1.27 Is the equipment fully Tropicalized? Yes/No

1.1.28 Do all equipment used Independently support Combustion. -----

1.1.29 Is mimic diagram provided? -----

1.1.30 Over load capacity. -----

1.2 Housing

1.2.1 Thickness of sheet steel. ----MM

1.2.2 Is sheet steel cold rolled ? Yes/No

1.2.3 Are ventilation louvers provided? Yes/No

1.2.4 Are ventilation louvers screened? Yes/No

1.2.5 Is the enclosure rigid, free floor standing? Yes/No

1.2.6 Are non magnetic flanges for input AC cable entry provided? Yes/No

1.2.7 IP Number of the housing as per IS:60947. -----

1.3 List of recommended spares for five years operation.

1.4 Tests

- 1.4.1 Tests mentioned in section 8.0 will be Performed including EMC testing. Yes/No

- 1.4.2.1 By testing only? Yes/No
- 1.4.2.2 Where will seismic testing be conducted? -----
- 1.4.3 Whether DCPS qualified as per IEEE-650 Yes/No
- 1.4.4 Which tests are proposed to be done at site? (List the number given in Specification)

- 1.5 List of deviations enclosed. Yes/No

- 1.6 Schematic diagram of DCPS enclosed. Yes/No

- 1.7 Delivery schedule

Schedule in weeks after placement of orders:
 - 1.7.1 Submission of drawings, QA plan, test : procedures
 - 1.7.2 Time allowed for approval by purchaser:
 - 1.7.3 Complete fabrication of first 24V DCPS :
 - 1.7.4 Schedule for completion of routine tests:
 - 1.7.5 Schedule for completion of special type: tests

1.7.6 Production schedule of balance 24V DCPS:

1.7.7 Schedule for inspection, testing and delivery at site of all equipment for first unit. :

1.7.8 Schedule for manufacture, inspection, testing and delivery at site of all equipment for second unit. :

1.7.9 Time required for erection of all equipment and keeping ready for commissioning. :

1.7.10 Time required for conducting site test. :

2.0 TENDER DRAWINGS

The Bidder shall list the tender drawings which are being submitted along with the bid. A general arrangement drawing showing main equipment layout, general features, overall dimensions, wiring arrangement etc, must accompany the bid.

3.0 TIME REQUIRED BY SUPPLIER

The supplier must state the period required for the preparation of drawings and the time he has allowed for approval of the drawings by the purchaser in the delivery period specified.

4.0 TRANSPORTATION

The supplier must state the mode of transportation whether by rail or by truck, and what measures will be taken to ensure that the equipment will not be damaged in transit.


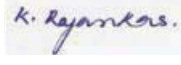
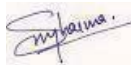
5.0 PROOF OF ABILITY

The bidder shall submit a brief list of work executed by him to standards and requirements specified in the tender document.

6.0 DEVIATIONS FROM SPECIFICATIONS

Any deviations in test procedure from this specification.

Any deviation in items offered.

			CE/416/NPCIL/24VDC		
			REV	00	
			PAGE	01	
			OF	01	
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		<p>REVISION: 00</p>	<p style="text-align: center;">APPROVED</p> <div style="text-align: center;">  </div> <p style="text-align: center;">RAJASEKAR K</p>		
		<p style="text-align: center;">PREPARED</p> <div style="text-align: center;">  </div> <p style="text-align: center;">AMIT KR SHARMA</p>	<p style="text-align: center;">ISSUED</p> <p style="text-align: center;">416</p>	<p style="text-align: center;">DATE</p> <p style="text-align: center;">28 / 8 / 15</p>	

QUALITY ASSURANCE PLAN FOR 24V DC MAIN BATTERY CHARGERS (SAMPLE)

Sl. No	Components and Operations	Characteristics	Class	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORDS	AGENCY			REMARKS
									P	W	V	
1.	Component Screening	Visual Burn-in Test Electrical Test Functional Test	C C C C	Verification	Sample	NPCIL spec. PC-E-251	NPCIL spec. PC-E-251	TC	2	2	1	
				Operational	Sample							
				Measurement	Sample							
				Performance	Sample							
2.	Power Transformer	Dimensions Voltage ratio Impedance voltage and load loss No load current & loss Insulation resistance Dielectric strength Temp. rise Double freq. Double voltage withstand test	B B C C C C C C	Measurement	100%	IS-11171	IS-11171 Class of insulation as per NPCIL spec.	TR	2	2,1	1	CHP
				Measurement	100%							
				Measurement	100%							
				Measurement	100%							
				Measurement	100%							
				Measurement	100%							
				Measurement	Sample							
				Measurement	Sample							
3.	Series Reactor	Dimension Inductance value Insulation resistance Dielectric strength Temp. rise Double freq. Double voltage withstand test	B B C C C C	Measurement	Sample	IS-5553	IS-5553	TR	2	2	1	
				Measurement	Sample							
				Measurement	Sample							
				Measurement	Sample							
				Performance	Sample							
				Performance	Sample							
				Measurement	Sample							
				Measurement	Sample							
4.	Control Transformer / Pulse Transformer	Dimension Terminal Marking & Polarity Voltage ratio No load current Insulation resistance Dielectric strength	B B C C C C	Measurement	Sample	IS-3156	IS-3156	TC	2	2	1	
				Verification	Sample							
				Measurement	Sample							
				Measurement	Sample							
				Measurement	Sample							
				Measurement	Sample							
				Measurement	Sample							
				Performance	Sample							

QUALITY ASSURANCE PLAN FOR 24V DC MAIN BATTERY CHARGERS (SAMPLE)

Sl. No	Components and Operations	Characteristics	Class	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORDS	AGENCY			REMARKS		
									P	W	V			
5.	Contactors	Visual Dimensions Operation (pick up / dropout) Type no./Marking Insulation resistance Dielectric strength	A	Verification	Sample	IS-60947 Manufacturer's catalogue	IS-60947	TC	2	2	1			
			B	Measurement	Sample					2	2	1		
			C	Performance	Sample						2	2	1	
			C	Verification	Sample						2	2	1	
6.	Moulded Case Circuit Breaker/ MCB	Visual Dimension Operation Type no./Marking Tripping characteristics Insulation resistance Dielectric strength	A	Verification	Sample	Manufacturer's Spec. IS-2516 IS-60898	IS-2516 IS-60898	TC	2	2	1			
			B	Measurement	Sample					2	2	1		
			C	Performance	Sample						2	2	1	
			C	Verification	Sample						2	2	1	
7.	Fuses	Dimension Type no./Marking Continuity	A	Measurement	Sample	Manufacturer's Spec.	IS-13703	TC	2	2	1			
			C	Verification	Sample					2	2	1		
			C	Verification	Sample						2	2	1	
			C	Verification	Sample						2	2	1	
8.	Fuse holders	Visual Dimension Type no./marking Insulation resistance Dielectric strength	A	Verification	Sample	Manufacturer's Spec.	Manufacturer's spec.	TC	2	2	1			
			A	Measurement	Sample					2	2	1		
			C	Verification	Sample						2	2	1	
			C	Measurement	Sample						2	2	1	
9.	Switches (select or/push button)	Visual Dimension Operation Type no./marking Insulation resistance Dielectric strength	B	Measurement	Sample	Manufacturer's Spec. IS-6975 IS-4794	IS-6975 IS-4794	TC	2	2	1			
			C	Verification	Sample					2	2	1		
			C	Performance	Sample						2	2	1	
			C	Verification	Sample						2	2	1	
			C	Measurement	Sample					2	2	1		
			C	Performance	Sample						2	2	1	
			C	Verification	Sample						2	2	1	
			C	Measurement	Sample						2	2	1	
			C	Performance	Sample					2	2	1		
			C	Performance	Sample						2	2	1	
			C	Measurement	Sample						2	2	1	
			C	Performance	Sample						2	2	1	

QUALITY ASSURANCE PLAN FOR 24V DC MAIN BATTERY CHARGERS (SAMPLE)

Sl. No	Components and Operations	Characteristics	Class	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORDS	AGENCY			REMARKS	
									P	W	V		
10.	Printed Circuit Board	Dimension	B	Measurement	100%	PP-E-1443	PP-E-1443	TC	2	2	1		
		Continuity	C	Verification	100%					2	2	1	
		Solderability	C	Verification	Sample						2	2	
		Insulation resistance	C	Measurement	Sample						2	2	
		Dielectric strength	C	Performance	Sample						2	2	
11.	Meters	Peel strength	C	Measurement	Sample					2	2		
		Visual	A	Verification	Sample	Manufacturer's Spec.	IS-1248 / IS-8573	TC	2	2	1		
		Dimension	B	Measurement	Sample					2	2		
		Type no./marking	C	Verification	Sample					2	2		
		Accuracy	C	Measurement	Sample					2	2		
12.	Current Transformer	Insulation resistance	C	Measurement	Sample	Manufacturer's Spec.	IS-1248 / IS-8573	TC	2	2	1		
		Dimension	B	Measurement	Sample	Manufacturer's Spec.	IS-2705	TC	2	2	1		
		Terminal	B	Verification	Sample					2	2		
		Marking & polarity	B	Verification	Sample					2	2		
		Turns ratio	C	Measurement	Sample					2	2		
13.	Relays	Insulation resistance	C	Measurement	Sample	Manufacturer's Spec.	IS-2705	TC	2	2	1		
		Dielectric strength	C	Performance	Sample					2	2		
		Dimension	B	Measurement	Sample	Manufacturer's Catalogue	IS-5051	TC	2	2	1		
		Coil	B	Measurement	Sample					2	2		
		Resistance	B	Measurement	Sample					2	2		
14.	Transistors	Operating voltages	C	Measurement	Sample					2	2		
		Insulation resistance	C	Measurement	Sample					2	2		
		Dielectric strength	C	Performance	Sample					2	2		
		Solderability	C	Performance	Sample					2	2		
		Dimension	B	Measurement	Sample	Manufacturer's spec.	IS-14901	TC	2	2	1		

QUALITY ASSURANCE PLAN FOR 24V DC MAIN BATTERY CHARGERS (SAMPLE)

Sl. No	Components and Operations	Characteristics	Class	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORDS	AGENCY			REMARKS
									P	W	V	
15.	Voltage reference diodes	Dimension Type no./marking Break down voltage Leakage current Burn-in Test for 48 hrs. Resistance to solvent	B	Measurement	Sample	Manufacturer's Spec.	IS-14901	TC	2	2	1	
			C	Verification	100%	IS-14901	Part-3	↓	↓	↓	↓	
			C	Measurement	100%	Part-3	↓	↓	↓	↓	↓	
			C	Performance	100%	Sample	↓	↓	↓	↓	↓	
16.	Signal diodes	Dimension Type No./marking Reverse leakage current Solderability	B	Measurement	Sample	Manufacturer's spec.	IS-14901	TC	2	2	1	
			C	Verification	100%	spec.	↓	↓	↓	↓	↓	
			C	Measurement	100%	IS-14901	↓	↓	↓	↓	↓	
17.	Power Diodes	Visual Dimension Type No./marking Reverse leakage current	A	Verification	100%	Manufacturer's Catalogue	IS-3895	TC	2	2	1	
			B	Measurement	Sample	IS-3895	↓	↓	↓	↓	↓	
			C	Verification	100%	IS-3895	↓	↓	↓	↓	↓	
18.	Low Power resistors	Visual Resistance value Solderability	A	Verification	Sample	IS-5786	IS-5786	TC	2	2	1	
			C	Measurement	100%	Part I-XI	Part I-XI	↓	↓	↓	↓	
			C	Verification	Sample	IS-5786	↓	↓	↓	↓	↓	
19.	Power resistors	Visual Type no./Marking Dimension Resistance value Insulation resistance Dielectric strength	A	Verification	100%	IS-5786	IS-5786	TC	2	2	1	
			B	Verification	100%	IS-8872	IS-8872	↓	↓	↓	↓	
			C	Measurement	Sample	IS-8872	↓	↓	↓	↓	↓	
			C	Measurement	100%	Sample	↓	↓	↓	↓	↓	

QUALITY ASSURANCE PLAN FOR 24V.DC MAIN BATTERY CHARGERS (SAMPLE)

Sl. No	Components and Operations	Characteristics	Class	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORDS	AGENCY			REMARKS
									P	W	V	
20.	ICs a) Linear	Visual Type No./marking Functional	B	Measurement	Sample	Manufacturer's Spec. IS-14901 Part-3	IS-14901 Part-3	TC	2	2	1	
			C	Verification Performance	Sample				2	2	1	
	b) Digital	Visual Type No./marking Functional	A	Verification	Sample	Manufacturer's Spec. IS-4317	IS-4317	TC	2	2	1	
			B	Verification Performance	Sample				2	2	1	
21.	Electrolyte capacitors a) for PCBs	Visual Type No./marking Dimension Capacitance value Leakage current	A	Verification	100%	Manufacturer's Spec. IS-4317	IS-4317	TC	2	2	1	
			B	Verification	100%				2	2	1	
	b) DC Filter	Visual Type No./Marking Leakage current Insulation resistance Dielectric strength	C	Measurement	Sample	Manufacturer's Spec. IS-4317	IS-4317	TC	2	2	1	
			C	Measurement	Sample				2	2	1	

QUALITY ASSURANCE PLAN FOR 24V DC MAIN BATTERY CHARGERS (SAMPLE)

Sl. No	Components and Operations	Characteristics	Class	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORDS	AGENCY			REMARKS
									P	W	V	
22.	Ceramic disc capacitor/ metallised polyester capacitor/ tantalum capacitors	Visual Type No./marking Dimension Capacitance value	A	Verification	100%	Manufacturer's Spec. JSS-50203/ JSS-50204 JSS-50205	JSS-50206/ JSS-50204 JSS-50205	TC ↓	2	2	1	
			B	Verification	100%				↓	↓	↓	
			C	Measurement	100%				↓	↓	↓	
23.	Lamination	Dimension Stacking factor Surface insulation	C	Measurement	Sample	IS-11794	IS-11794	TC ↓	2	2	1	
			B	Verification	100%				↓	↓	↓	
			C	Verification	Sample				↓	↓	↓	
24.	PVC insulated copper wire	Visual Dimension Insulation resistance Dielectric strength	A	Verification	100%	IS-694	IS-694	TC ↓	2	2	1	
			C	Measurement	100%				↓	↓	↓	
			C	Measurement	100%				↓	↓	↓	
25.	Thyristors / Power Transistors	Visual Type No./Marking Triggering leakage	A	Measurement	Sample	Manufacturer's spec. IS-7788 IEC-146	IS-7788 IEC-146	TC ↓	2	2	1	
			B	Verification	100%				↓	↓	↓	
			C	Performance	100%				↓	↓	↓	
26.	Electrical (wiring)	Routing of wires Bunching, Ferruling, Crimping, soldering, Clearance and colour coding	B	Visual	100%	Manufacturer's spec.	Manufacturer's spec.	TC ↓	2	2	1	
			B	Visual	100%				↓	↓	↓	

ANNEXURE - B

QUALITY ASSURANCE PLAN FOR 24V DC MAIN BATTERY CHARGERS (SAMPLE)

Sl. No	Components and Operations	Characteristics	Class	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORDS	AGENCY			REMARKS
									P	W	V	
27.	Painting	Pretreatment check Scratch hardness check Bend (flexibility) Test Pull of Adhesion test Painting thickness check	C	Process	Clause no. 3.0 of IS-101	PC-E-251	PC-E-251	TR	2	2,1	1	CHP To be conducted on test coupon
			B	Physical	Clause no. 2.0 of IS-101	IS-101	IS-101	→	→	→	→	
			B	Mechanical	Clause no. 5.0 of IS-101	IS-101	IS-101	→	→	→	→	
			B	Physical	Clause no. 5.0 of IS-101	IS-101	IS-101	→	→	→	→	
28.	Sub Assembly	Dimension Component verification Layout verification Wiring check Insulation resistance Dielectric strength	B	Measurement	Sample	PC-E-251	PC-E-251	TC	2	2	1	
			B	Measurement	Sample	Manufacturer's drawings	Manufacturer's drawings	→	→	→	→	
			B	Comparison	Sample	Manufacturer's drawings	Manufacturer's drawings	→	→	→	→	
			B	Comparison	Sample	Manufacturer's drawings	Manufacturer's drawings	→	→	→	→	
			C	Continuity	Sample	Manufacturer's drawings	Manufacturer's drawings	→	→	→	→	
			C	Measurement	Sample	Manufacturer's drawings	Manufacturer's drawings	→	→	→	→	
29.	Final Assembly and pre testing	Dimension Component verification Layout verification Wiring check Cable identification Insulation resistance Dielectric strength	B	Measurement	100%	Manufacturer's drawings	Manufacturer's drawings	TC	2	2	1	
			B	Comparison	100%	Manufacturer's drawings	Manufacturer's drawings	→	→	→	→	
			B	Comparison	100%	Manufacturer's drawings	Manufacturer's drawings	→	→	→	→	
			C	Continuity	100%	Manufacturer's drawings	Manufacturer's drawings	→	→	→	→	
			B	Comparison	100%	Manufacturer's drawings	Manufacturer's drawings	→	→	→	→	
			C	Measurement	100%	Manufacturer's drawings	Manufacturer's drawings	→	→	→	→	
30.	Final testing (a) Physical Verification	Presence of all items as per Bill Of Material (BOM)	B	Visual	100%	Manufacturer's drawings	Manufacturer's drawings	TC	2	2	1	
						Manufacturer's drawings	Manufacturer's drawings	→	→	→	→	

QUALITY ASSURANCE PLAN FOR 24V DC MAIN BATTERY CHARGERS (SAMPLE)

Sl. No	Components and Operations	Characteristics	Class	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORDS	AGENCY			REMARKS
									P	W	V	
31.	Performance test	Dimension	C	Measurement	100%	As per approved test procedure	As per approved test procedure	TR	2	2,1	1	CHP
		Connection checking	B	Performance	100%							
		High voltage test	B	Performance	100%							
		Alarm and indication	B	Performance	100%							
		Efficiency test	C	Measurement	100%							
		Voltage regulation of rectifier	C	Measurement	100%							
		Ripple content of rectifier	C	Measurement	100%							
		Undershoot and overshoot of rectifier output	B	Measurement	100%							
		Input inrush current measurement test	C	Measurement	100%							
		Dry heat test for PCBs	C	Performance	One no. each type							
		Damp heat test for PCBs	C	Performance	100%							
		Short circuit capability	C	Performance	100%							
		Temperature rise test	C	Performance	One DCPS							
		Diode Voltage Regulator operation test	C	Performance	100%							

QUALITY ASSURANCE PLAN FOR 24V DC MAIN BATTERY CHARGERS (SAMPLE)

Sl. No	Components and Operations	Characteristics	Class	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORDS	AGENCY			REMARKS
									P	W	V	
		Burn-in test	C	Performance	100%	As per approved test procedure	As per approved test procedure	TR	2	2,1	1	CHP
		Qualification as per IEEE-650	C	Performance	One DCPS	As per approved test procedure			3			
		EMC test	C	Performance	One DCPS				3			
		Battery charging test at boost voltage	C	Performance	100%				2			
		Battery charging test at equalize voltage	C	Performance	100%							
		Insulation resistance value	B	Performance	100%	As per design document	More than 5 megohm.					
	Insulation test											
	(a) between I/P and Earth											
	(b) between O/P and Earth											
	(c) Between I/P and O/P											

LEGEND:

P	: Performed by	A	: Minor	1.	: Purchaser
W	: Witnessed by	B	: Major	2.	: Prime Supplier
V	: Verified by	C	: Critical	3.	: External Laboratory
		TC	: Test Certificate		
		TR	: Test Report		
		CHP	: Customer Hold Point		



A4-10

CE/416/NPCIL/24VDC

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PAGE 01 OF 01

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ANNEXURE-C

LIST OF ALARMS AND INDICATORS

REVISION: 00

APPROVED

RAJASEKAR K

PREPARED

AMIT KR SHARMA

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DETAILS OF ALARM AND INDICATIONS

Sl. No.	Alarm description	Potential Free Contact required	LED indication required	Input CB status	Output CB status	Main DCPS contactor status	Standby DCPS contactor status	Applicability	Remarks
1	24V DC Load on standby DCPS	YES	YES	ON	ON	ON	ON	DCPS-1,2,3,5,6	Alarm & trip
2	24V DC Low Battery for DCPS	YES	YES	ON	ON	OFF	OFF	ALL DCPS	Alarm
3	24V DCPS voltage trouble	YES	YES	ON (OFF during DC overvoltage trip)	ON	OFF	ON	ALL DCPS	Alarm & trip
4	24V DCPS Battery CB open	YES	YES	ON	ON	ON	OFF	DCPS-1,2,3,5,6	Alarm
5	24V DCPS input voltage high	YES	YES	ON	ON	ON	OFF	ALL DCPS	Alarm
6	24V DCPS input current high	YES	YES	ON	ON	ON	OFF	ALL DCPS	Alarm
7	Mains failure	YES	YES	ON	ON	OFF	ON	ALL DCPS	Alarm & trip

Sl. No.	Alarm description	Potential Free Contact required	LED indication required	Input CB status	Output CB status	Main DCPS contactor status	Standby DCPS contactor status	Applicability	Remarks
8	Control power supply failure	YES	YES	ON	ON	OFF	ON	ALL DCPS	Alarm & trip
9	24V DCPS Output voltage Low	YES	YES	ON	ON	OFF	ON	ALL DCPS	Alarm & trip
10	24V DCPS output overload	YES	YES	ON	ON	ON	OFF	ALL DCPS	Alarm & trip
11	Battery charging current high	YES	YES	ON	ON	ON	OFF	ALL DCPS	Alarm
12	Equipment over temperature	YES	YES	ON	ON	ON	OFF	ALL DCPS	Alarm
13	Battery on load	YES	YES	ON	ON	OFF	OFF	DCPS-1,2,3,5,6	Alarm
14	Standby not available	YES	YES	ON	ON	ON	OFF	DCPS-1,2,3,5,6	Alarm
15	Rectifier Fuse failure	YES	YES	ON	ON	ON	OFF	ALL DCPS	Alarm
16	Capacitor fuse failure	YES	YES	ON	ON	ON	OFF	ALL DCPS	Alarm
17	Fan failure	YES	YES	ON	ON	ON	OFF	ALL DCPS	Alarm
18	Output CB tripped	YES	YES	ON	OFF	OFF	ON	ALL DCPS	Alarm & trip
19	DC over voltage	YES	YES	OFF	ON	OFF	ON	ALL DCPS	Alarm & trip



A4-10

CE/416/NPCIL/24VDC

REV 00

PAGE 01 OF 01

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ANNEXURE-D

BLOCK DIAGRAM OF CHARGER

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29 / 8
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A4-10

CE/416/NPCIL/24VDC

REV 00

PAGE 01 OF 01

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ANNEXURE-E

FEEDER LOAD LIST AND BATTERY SIZING

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PROJECT: KAPP 3 & 4 (TG & BOP C&I)
24V DC CHARGER/Load List

Feeder no	Feeder Description	Identification Code	Feeder Load in Amps	MCB rating in Amps	Fuse rating in Amps	Suitable Cable
1		64000-PL-41	40	50	60	2C X 70
		64000-PL-42				
2		64000-PL-43	40	50	60	2C X 70
		64000-PL-44				
3		64000-PL-45	10	16	20	2C X 70
4		64000-PL-01	30	40	50	2C X 70
		64000-PL-02				
		64000-PL-03				
5		64000-PL-04	30	40	50	2C X 70
		64000-PL-05				
		64000-PL-06				
6		64000-PL-07	30	40	50	2C X 70
		64000-PL-08				
		64000-PL-09				
7		64000-PL-10	30	40	50	2C X 70
		64000-PL-11				
		64000-PL-12				
8		64000-PL-13	30	40	50	2C X 70
		64000-PL-14				
		64000-PL-15				
9		64000-PL-16	30	40	50	2C X 70
		64000-PL-17				
		64000-PL-18				
10		64000-PL-19	30	40	50	2C X 70
		64000-PL-20				
		64000-PL-21				
11		64000-PL-22	30	40	50	2C X 70
		64000-PL-23				
		64000-PL-24				
12		64000-PL-29	15	20	25	2C X 70
13		64000-PL-30	15	20	25	2C X 70
CUSTOMER LOADS						
14			63	80	100	
15			2	4	6	
		Total Load	425			
		Total load Incl 15% design margin	489			
		10% of battery Ah	123			
		Charger rating (A)	612			

SUMMARY OF NUMBER OF FEEDERS (MCB/FUSE)				
S.No	Rating	Qty. USED	SPARE	TOTAL
1	4A/6A	1	1	2
3	16A/20A	1	1	2
4	20A/25A	2	1	3
6	40A/50A	8	2	10
7	50A/60A	2	1	3
7	80A/100A	1	1	2
8	TOTAL	15	7	20

Note: The above feeders mentioned for the DCDB-1 of charger-1. DCDB-2 and DCDB-1 are identical.

BATTERY SIZING:				
MAKE OF BATTERY		HBL	BUI*	EXIDE
RATED LOAD (Amps)		489		
Permissible Voltage variation at Panels in volts (A)		18 - 36 V		
Allowed Voltage drop from Battery to DCDB to DCS panels : (B)		4.75		
Minimum voltage at Battery bank after discharge for 1 hour C=(A+B)		22.75		
End cell voltage 'ECV' after discharge for 1 hour in Volts per cell (D)		1.75	1.75	1.75
Number of cells required F= (C /D)		13	13	13
Number of cells considered for providing 26V DC voltage		13	13	13
K-factor (G)		1.66	1.67	1.67
Ageing factor (H)		1.25	1.25	1.25
Design margin # (I)		1	1	1
Temperature correction factor (J)		1.207	1.207	1.207
Considering K-factor, Ageing factor, Design margin & TCF Required Ah = RATED LOAD x G x H x I x J		1225	1232	1232
CABLE SIZE CALCULATION				
Voltage drop from Battery to Charger to DCDB				
1	Number of cells (A)			13
2	Float Voltage per cell 2.2 V (B)			2.2
3	Float mode Voltage at Battery Charger (C) = A x B			28.6
4	Distance from Battery to Charger in mtrs (D)			165
5	Load Current (Amps) (E)			425
6	Size of Cable from Battery to Charger (Sqmm bare COPPER)			240
7	Resistance of cable at 20 deg.C in Ohms/Km (F)			0.0762
8	Resistance of cable at 40 deg.C in Ohms/Km (G) = F/0.926			0.0823
9	Voltage drop in Cable per run (Volts) (H)=(ExGx2D)/1000			11.541
10	Number of runs of cable per pole (I)			3
11	Voltage Drop for "I" runs of cable (Volts) (J) = H/I			3.847
Voltage drop from charger to DCDB				
1	charger to DCDB connected by solid Cu bus bar (Z)			0
Voltage drop from DCDB to DCS Panels				
1	Distance from DCDB to Panels (mtrs) (K)			20
2	Panel Load Current range (Amps)			0 - 15
3	Max Load current considered (Amps) (L)			40
4	Size of Cable from DCDB to Panels (Sqmm bare copper)			70
5	Resistance of cable at 20 deg.C (Ohms/Km) (M)			0.27
6	Resistance of cable at 45 deg.C (Ohms/Km) (N) = M / 0.909			0.297
7	Voltage drop in Cable (Volts) (O) =(2KxLxN)/1000			0.475
10	Number of runs per pole (P)			1
11	Voltage Drop for "I" runs of cable (Volts) (Q) = O/P			0.475
Total Voltage drop (Battery to Charger to DCDB to Panels) = J+Z+Q				4.322
Voltage available at panel on Full Load in Float Mode				24.278
Note:-				
1. The cable conductor resistance are taken as per IS:8130-1984,Table 2 for stranded Al conductor, Class 2,Annexure-A.				
2. 1C 630Sqmm cable envisaged between battery to charger. Two runs will be used as +ve cable and another two as -ve.				
3. 2C 35 Sqmm cable envisaged between charger to panels. One core will be used as +ve cable and another as -ve				
3. Design margin of 1 is considered in battery sizing as 15% margin is already considered in load.				
* M/s BUI is acquired byM/s Union Batteries				

Note: Battery sizing and cable sizing shown above are on for reference of charger vendors and these are not in scope of supply of this tender.



A4-10

CE/416/NPCIL/24VDC

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PAGE 01 OF 01

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ANNEXURE-F

TECHNICAL COMPLIANCE SHEET FOR DCDB TO BE FILLED BY PARTICIPATING VENDORS AND SUBMITTED ALONG WITH TECHNICAL BID

REVISION: 00

APPROVED

RAJASEKAR K

PREPARED

AMIT KR SHARMA

ISSUED

416

DATE

28 / 8 / 15

ANNEXURE – F

TECHNICAL PARTICULARS REQUIRE

1.0 TECHNICAL DATA TO BE SUPPLIED ALONGWITH THE TENDER

Tenderers shall submit with their bids, a complete description of all equipment on which their bid is based and such description shall include the details given hereunder. It is necessary that all details shall be completely filled in the first instance to evaluate the bid and compare it with other offers.

Bids with incomplete or ambiguous information shall not be considered.

The details hereunder shall be complete in all respects and reference to other places shall be avoided as far as possible.

Class I
24V DC

- 2.1 Complete Equipment
 - 2.1.1 Make
 - 2.1.2 Type reference
 - 2.1.3 Is indication provided?
 - 2.1.4 Is voltmeter provided?
 - 2.1.5 Is ammeter provided?
 - 2.1.6 Are fuse ratings as per specifications?
 - 2.1.7 Are no. of sub-buses as per specifications?
 - 2.1.8 Are no. of MCBs as per specification?
 - 2.1.9 Are ratings of CBs as per specs?

Class I
24V DC

- 2.1.10** Is cable entry from bottom/top?
- 2.1.11** Ambient temperature and humidity at which the system can operate satisfactorily.
- Temperature
- Humidity
- 2.1.12** Are the panels seismically Qualified?
- 2.1.13** Whether panels are seismically qualified by analysis and testing or by testing
- 2.1.14** Mean time between failure of
- Complete equipmentHrs
 - Device having lowest MTBFHrs
 - MTTRHrs
- 2.1.15** Are the electronic components subjected to burn-in-test before use? Yes/No.
- 2.1.16** Is the equipment fully tropicalised? Yes/No.
- 2.1.17** Is the empty panel electromagnetic shielded and Flasher unit EMC tested? Yes/No.
- 2.1.18** Do all equipment used independently support combustion? Yes/No.

Class I
24V DC

2.1.19	Are the panels natural cooled?	Yes/No.	
2.1.20	Temperature rise anticipated inside panel	--- ⁰ C.	
2.1.21	Is the color shade of the panel shade 365 as per IS-5 for KAPP-3?	Yes/No.	
2.1.22	Is the color shade of the panel shade 275 as per IS-5 for KAPP-4?	Yes/No.	
2.1.23	Weight of each panel		
2.1.24	Overall size of every panel.		
	Heightmm	
	Lengthmm	
	Depthmm	
2.1.25	Insulation resistance of panel at 500V DC.		
2.1.26	Voltage proof of every panel at 1500 V AC.		
2.1.27	Is Insulation Monitoring Device (IMD) mounted?		N
2.1.28	Is scanner and Earth Fault Sensor (EFS) mounted?		N
2.1.29	Is selector HS provided for meter selection?		N

Class I
24V DC

- 2.1.30 Are HS's provided to connect IMD & scanner?
- 2.1.31 Is LCM mounted & wired?
- 2.1.32 Is MSCPD mounted? Not Applicab
- 2.1.33 Are terminations provided for incoming cables?
- 2.1.34 Are bus bars as per specifications?
- 3.0 HOUSING**
- 3.1 Thickness of sheet steel.mmr
- 3.2 Is sheet steel cold rolled? Yes/No
- 3.3 Are ventilation louvers provided? Yes/No
- 3.4 Are ventilation louvers screened? Yes/No
- 3.5 Is the enclosure rigid free floor standing? Yes/No
- 3.6 Is rear access available? Yes/No
- 3.7 Are the panels electromagnetically shielded? Yes/No
- 4.0 TESTS**
- The component tests and other functional tests mentioned in section 8.0 will be performed. Yes/No.

4.1 IR/HV test at appropriate voltage level will be performed at site. Yes/No.

5.0 TENDER DRAWINGS

The Bidder shall list the tender drawings which are being submitted along with the bid. A general arrangement drawing showing main equipment layout, general features, overall dimensions, wiring arrangement etc, must accompany the bid.

6.0 TIME REQUIRED BY SUPPLIER

The supplier must state the period required for the preparation of drawings and the time he has allowed for approval of the drawings by the purchaser in the delivery period specified.

7.0 TRANSPORTATION

The supplier must state the mode of transportation whether by rail or by truck, and what measures will be taken to ensure that the equipment does not get damaged in transit.

8.0 PROOF OF ABILITY

The bidder shall submit a brief list of jobs executed by him (and name of respective customers) to standards and tolerances specified in the tender document. The bidder shall clearly indicate seismically qualified Control power supply distribution system contracts executed, if any.

9.0 LIST OF APPENDICES

A list of all appendices, annexure, characteristic curves, printed technical literatures which form an integral part of this tender shall be listed.

10.0 DEVIATIONS FROM SPECIFICATIONS

The bidder shall note that all the details of the technical specification are not brought out in the section no. 2 against "Technical data to be supplied along with the tender" format. Hence, the bidder shall confirm that the system is as per this complete specification. In case of any deviations, from the technical specification, the deviation shall be clearly listed referring the section of the tender document in order, under the specific heading of deviations from technical specification. Bids which do not list deviations specifically under this heading or do not confirm there are no deviations from the technical specification will not be considered for evaluation.



A4-10

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PAGE 01 OF 01

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ANNEXURE-G

QAP FOR DCDB

(The QAP is subject to approval)

REVISION: 00

APPROVED

RAJASEKAR K

PREPARED

AMIT KR SHARMA

ISSUED

416

DATE

28 / 8 / 15

QUALITY ASSURANCE PLAN FOR MAIN CONTROL CENTRE POWER SUPPLY DISTRIBUTION PANELS (SAMPLE)

Sl. No	Components and operations	Characteristics	Class	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORDS	AGENCY			REMARKS
									P	W	V	
1.	Miniature Circuit Breaker	Visual Dimension Operation Type no / making Tripping characteristics Insulation resistance Die-electric strength	A	Verification	100% Sample	Manufacturer's Spec. IS/IEC-60898	IS/IEC-60898	TC →	2	2	1	→
			B	Measurement Performance	100%				2	2	1	
			B	Verification	100%				2	2	1	
			C	Measurement	100%				2	2	1	
			C	Measurement Performance	100%				2	2	1	
			C	Measurement Performance	100%				2	2	1	
2.	Series reactors	Dimension Inductance Value Insulation resistance Dielectric strength Temp. rise Double Freq. Double Voltage withstand test	B	Measurement	100%	IS-5553	IS-5553	TR →	2	2	1	→
			B	Measurement	100%				2	2	1	
			C	Measurement	100%				2	2	1	
			C	Performance	100%				2	2	1	
			C	Measurement	100%				2	2	1	
			C	Measurement Performance	100%				2	2	1	
3.	Control Transformer / Pulse Transformer	Dimension Terminal Marking & Polarity Voltage ratio No load current Insulation resistance Dielectric strength	B	Measurement	100%	IS-3156	IS-3156	TC →	2	2	1	→
			B	Verification	100%				2	2	1	
			C	Measurement	100%				2	2	1	
			C	Measurement	100%				2	2	1	
			C	Measurement	100%				2	2	1	
			C	Measurement Performance	100%				2	2	1	

ANNEXURE - G

QUALITY ASSURANCE PLAN FOR MAIN CONTROL CENTRE POWER SUPPLY DISTRIBUTION PANELS (SAMPLE)

Sl. No	Components and Operations	Characteristics	Class	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORDS	AGENCY			REMARKS
									P	W	V	
4.	Fuses	Dimension Type no / Marking Continuity	A C C	Measurement Verification Verification	Sample Sample Sample	Manufacturer's spec.	IS-13703	TC ↓	2	2	1	
									↓	↓	↓	
									↓	↓	↓	
5	Fuse holders	Visual Dimension Type no/marking Insulation resistance Dielectric strength	A A C C C	Verification Measurement Verification Measurement Performance	Sample Sample Sample sample Sample	Manufacturer's spec.	Manufacturer's spec.	TC ↓	2	2	1	
									↓	↓	↓	
									↓	↓	↓	
6.	Printed Circuit Board	Dimension Continuity Solderability Insulation resistance Dielectric strength Peel strength	B C C C C C	Measurement Verification Verification Measurement Performance Measurement	Sample Sample Sample Sample Sample	PP-E-1443	PP-E-1443	TC ↓	2	2	1	
									↓	↓	↓	
									↓	↓	↓	
7.	Relays	Dimension Coil Resistance Operating voltages Insulation resistance Dielectric strength Solderability	B B C C C C	Measurement Measurement Measurement Performance Performance	Sample Sample Sample Sample Sample	Manufacturer's Catalogue IS-5051	IS-5051	TC ↓	2	2	1	
									↓	↓	↓	
									↓	↓	↓	

ANNEXURE - G

QUALITY ASSURANCE PLAN FOR MAIN CONTROL CENTRE POWER SUPPLY DISTRIBUTION PANELS (SAMPLE)

Sl. No	Components and Operations	Characteristics	Class	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORDS	AGENCY			REMARKS	
									P	W	V		
8.	Transistors	Dimension Type No./Marking Solderability Breakdown voltage V _{ceo} Amplification factor Collector leakage current Resistance to solvent	B B C C C C C	Measurement	Sample	Manufacturer's spec. IS-14901	IS-14901	TC	2	2	1		
				Verification	Sample							1	
				Verification	Sample							2	
				Measurement	Sample							2	
9.	Voltage reference diodes	Dimension Type no. / Marking Breakdown voltage Leakage current Resistance to solvent	B B C C C	Measurement	Sample	Manufacturer's spec. IS-14901-3	IS-14901-3	TC	2	2	1		
				Verification	Sample							1	
				Measurement	Sample							2	
				Performance	Sample							2	
10.	Signal diodes	Dimension Type no./Marking Reverse leakage current Solderability	B B C C	Measurement	Sample	Manufacturer's spec. IS-14901-3	IS-14901-3	TC	2	2	1		
				Verification	Sample							1	
				Measurement	Sample							2	
				Performance	Sample							2	

ANNEXURE - G

QUALITY ASSURANCE PLAN FOR MAIN CONTROL CENTRE POWER SUPPLY DISTRIBUTION PANELS (SAMPLE)

Sl. No	Components and Operations	Characteristics	Class	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORDS	AGENCY			REMARKS
									P	W	V	
11.	Low power resistors	Visual Resistance value Solderability	A	Verification	Sample	IS-5786 Part I - XI	IS-5786 Part I - XI	TC ↓	2	2	1	
			C	Measurement	Sample				2	2	1	
			C	Verification	Sample				2	2	1	
12.	ICs a) Linear	Visual Type no./ Marking Functional checks	B	Measurement	Sample	Manufacturer's spec. IS-14901	IS-14901	TC ↓	2	2	1	
			B	Verification	Sample				2	2	1	
			C	Performance	Sample				2	2	1	
	b) Digital	Visual Type no./Marking Functional checks	A	Verification	Sample	Manufacturer's spec. IS-590	IS-590	TC ↓	2	2	1	
			B	Verification	Sample				2	2	1	
			C	Performance	Sample				2	2	1	
13.	Capacitors For PCBs	Visual Type No./marking Dimension Capacitance value Leakage current	A	Verification	Sample	Manufacturer's spec. IS-590	IS-590	TC ↓	2	2	1	
			B	Verification	Sample				2	2	1	
			C	Measurement	Sample				2	2	1	
			C	Measurement	Sample				2	2	1	

ANNEXURE – G
QUALITY ASSURANCE PLAN FOR MAIN CONTROL CENTRE POWER SUPPLY DISTRIBUTION PANELS (SAMPLE)

Sl. No	Components and Operations	Characteristics	Class	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORDS	AGENCY			REMARKS	
									P	W	V		
14.	Ceramic disc capacitor/metalised polyester capacitor/tantalum capacitors	Visual Type No. / marking Dimension Capacitance value For ceramic disc capacitors	A B C C	Verification Verification Measurement Measurement Performance	Sample Sample Sample Sample	Manufacturer's spec. JSS-50203/ JSS-50204 JSS-50205 IS-8507	JSS-50206/ JSS-50204 JSS-50205 IS-8507	TC →	2 → → →	2 → → →	1 → → →		
15.	Flasher Relay (Solid State)	Visual Dimension Di-Electric Strength Insulation Resistance Setting Accuracy for the Set time Repeat Accuracy	As per NPCIL approved procedure	As per NPCIL approved test procedure	As per NPCIL approved test procedure	As per NPCIL approved test procedure	As per NPCIL approved test procedure	As per NPCIL approved test procedure					
16.	Flasher Failur Unit (Solid state)	Visual Dimension Di-Electric Strength Insulation Resistance Functional Test 100-hr Burn in	As per NPCIL approved procedure	As per NPCIL approved test procedure	As per NPCIL approved test procedure	As per NPCIL approved test procedure	As per NPCIL approved test procedure	As per NPCIL approved test procedure					
17.	Ground Fault Detection system	Refer Specification No. PB-E-249	Refer Specification No. PC-E-249	Refer Specification No. PC-E-249	Refer Specification No. PC-E-249	Refer Specification No. PC-E-249	Refer Specification No. PC-E-249	Refer Specification No. PC-E-249					

ANNEXURE – G

QUALITY ASSURANCE PLAN FOR MAIN CONTROL CENTRE POWER SUPPLY DISTRIBUTION PANELS (SAMPLE)

Sl. No	Components and Operations	Characteristics	Class	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORDS	AGENCY			REMARKS
									P	W	V	
18.	MCB status Monitoring system	Refer Specification No. PC-E-248	Refer Specification No. PC-E-248	Refer Specification No. PC-E-248	Refer Specification No. PC-E-248	Refer Specification No. PC-E-248	Refer Specification No. PC-E-248	Refer Specification No. PC-E-248				
19.	Handswitches (Selector)	Visual Dimension Operations Type no. / marking Insulation resistance Die-electric strength	B C C C C	Measurement Verification Performance Verification Measurement Performance	100% Sample 100% 100% 100% Sample	Manufacturer's Spec IS/IEC-60947-5	IS/IEC-60947-5	TC	2	2	1	
20.	Meters	Visual Dimensions Type no. / marking Accuracy Insulation Resistance	A B C C C	Verification Measurement Verification Measurement	100% Sample 100% 100%	Manufacturer's Spec. IS-1248/8573	IS-1248/8573	TC	2	2	1	

QUALITY ASSURANCE PLAN FOR MAIN CONTROL CENTRE POWER SUPPLY DISTRIBUTION PANELS (SAMPLE)

Sl. No	Components and Operations	Characteristics	Class	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORDS	AGENCY			REMARKS
									P	W	V	
21.	PTFE insulated Copper Wire including 22 AWG (30/7) silver copper conductor and PTFE insulated wire for MCB/SMS (auxiliary contact wiring)	Visual Dimensional insulation resistance Dielectric strength	A C C C	Verification Measurement Measurement Performance	Sample Sample Sample Sample	MIL-W-16878E	MIL-W-16878E	TC ↓	2 ↓	2 ↓	1 ↓	
22.	Electrical (wiring)	Routing of Wires Bunching, Ferruling, Crimping, Soldering, Clearance and colour Coding	Major	Visual	100%	Manufacture's Spec.	Manufacturer's Spec.	TC ↓	2 ↓	2 ↓	1 ↓	
23.	Painting	Pretreatment check Scratch hardness check Bend (Flexibility) Test Pull of Adhesion test Painting thickness check	C B B B B	Process Physical Mechanical Physical Measurement	Type test on test coupon Clause no. 3.0 of IS-101 Clause no. 2.0 of IS-101 Clause no. 5.0 of IS-101	PC-E-253 IS-101 IS-101 IS-101 PC-E-253	PC-E-253 IS-101 IS-101 IS-101 PC-E-253	TR ↓	2 ↓	2 ↓	1 ↓	CHP ↓

ANNEXURE -G
QUALITY ASSURANCE PLAN FOR MAIN CONTROL CENTRE POWER SUPPLY DISTRIBUTION PANELS (SAMPLE)

Sl. No	Components and Operations	Characteristics	Class	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORDS	AGENCY			REMARKS
									P	W	V	
24.	Final Assembly and pre testing	Dimension Component verification Layout verification Wiring Check Cable identification Insulation resistance Dielectric strength	Major Major Critical Major Critical Critical	Measurement	100%	Manufacturer's drawings	Manufacturer's drawings	TC	2	2	1	
				Verification	100%				2	2	1	
				Verification	100%				2	2	1	
				Continuity	100%				2	2	1	
25.	Final Testing (a) Physical Verification	Presence of all items as per BOM	B	Visual	100%	Manufacturer's drawings	Manufacturer's drawings	TC	2	2	1	
26.	Test on system. Type Test	Dimension of modules and panels Connection checking of modules High Voltage Test on panels Functional test as per referred EDs	C B B B	Measurement	Sample	As per approved test procedure	As per approved test procedure	TR	2	2	1	CHP
				Performance	Sample				2	1	1	
				Performance	Sample				2	1	1	
				Performance	100%				2	1	1	

ANNEXURE -G

QUALITY ASSURANCE PLAN FOR MAIN CONTROL CENTRE POWER SUPPLY DISTRIBUTION PANELS (SAMPLE)

Sl. No	Components and Operations	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTU M OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORDS	AGENCY			REMARKS																		
									P	W	V																			
27.	Acceptance tests	Dimensions of module, panels Insulation resistance test of panels and modules High voltage test of panel Functional test on panels	C	Measurement	100%	As per approved procedure	As per approved procedure	TR	2	2	1	CHP																		
													B	Measurement	100%	As per approved procedure	As per approved procedure	TR	2	2	1									
																						B	Measurement	100%	As per approved procedure	As per approved procedure	TR	2	2	1
28.	Special type test	Environmental test EMC test MCB Coordination test Seismic Qualification	C	Performance	One sub assembly One panel & Flasher unit Each type Two panels	As per approved test procedure IEC-61000-5-7 PC-E-710	As per approved test procedure	TR	2	2,	1	CHP																		
													C	Performance	One panel & Flasher unit	As per approved test procedure	IEC-61000-5-7 PC-E-710	As per approved test procedure	TR	1	1									
																						C	Performance	Each type	As per approved test procedure	As per approved test procedure	TR	1	1	
																														C

LEGEND:

- | | | | | | | | | |
|---|---|--------------|-----|---|---------------------|----|---|---------------------|
| P | : | Performed by | A | : | Minor | 1. | : | Purchaser |
| W | : | Witnessed by | B | : | Major | 2. | : | Prime Supplier |
| V | : | Verified by | C | : | Critical | 3. | : | External Laboratory |
| | | | TC | : | Test Certificate | | | |
| | | | TR | : | Test Report | | | |
| | | | CHP | : | Customer Hold Point | | | |



A4-10

CE/416/NPCIL/220VDC

REV 00

PAGE 01 OF 01

**PROJECTS : KAPP UNIT 3 & 4 2X700MWe (TISCS Package)
: RAPP UNIT 7 & 8 2X700MWe (TISCS Package)**

CUSTOMER : M/s. NPCIL, MUMBAI

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**TECHNICAL SPECIFICATION
FOR
220V DC POWER SUPPLY SYSTEM**

REVISION: 00

APPROVED

RAJASEKAR K

PREPARED

AMIT KR SHARMA

ISSUED

416

DATE

29 / 8 / 15



A4-11

CE/416/NPCIL/220VDC/INDEX

REV 00

PAGE 01 OF 01

CONTENTS

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SECTION	DESCRIPTION
A	GENERAL INSTRUCTIONS TO BIDDERS
B	PRE-QUALIFICATION REQUIREMENTS
C	SCOPE OF SUPPLY
D	TECHNICAL REQUIRMENTS
E	ANNEXURES



A4-11

CE/416/NPCIL/220VDC/A

REV 00

PAGE 01 OF 01

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SECTION- A

GENERAL INSTRUCTIONS TO BIDDERS:

Introduction: Bidders are required to offer 220V DC Charger system to be used for powering DCS panels of secondary cycle of Nuclear Power Plants. All required documents against this Tender/Specification shall be submitted in English only.

Pre-qualification requirements (PQR) are clearly mentioned in Section-B of this Specification. In case Bidder does not meet Pre-qualification requirements, their offer will be summarily rejected and Bidder's Technical offers will not be evaluated.

1. Evaluation methodology:

- BHEL shall initially open Bidder's PQR documents (to be submitted as per Section-B clause-AA) only, for review, evaluation & acceptance by BHEL.
- Technical bids shall be opened for review and further consideration for only those bidders who meet Pre-qualification requirements. Technical offer of bidders who does not meet Pre-qualification requirements will not be opened for further consideration and shall be declared as technically rejected.
- Bidders declared qualified for meeting requirements mentioned in section B and are presently not registered with BHEL EDN Bangalore for supplying the charger system, shall be informed by email to submit online BHEL vendor registration form at www.bhel.com.
- Bidders declared qualified for meeting section-B requirements and are not approved by end customer (M/s NPCIL) for the project, their credentials documents as provided by bidder (under section-B), shall be forwarded to NPCIL for approval.
- Bidders who are not approved by customer (M/s NPCIL), their offers shall be technically rejected and shall not be considered for further process for procurement.

2. Submission of documents:

- Documents pertaining to Pre-Qualification requirement Section B clause AA should be submitted in a Separate cover. "Section B clause AA" should be written on this cover.
- Documents pertaining to Pre-Qualification requirement (Section B clause BB) should be submitted in a Separate cover marked as "Section B clause BB".
- Technical offers/proposals pertaining to Sections C & D should be submitted in a separate cover marked as "Technical offer".

3. Whenever required during evaluation of PQR and Technical offers/bids, vendor should be present at BHEL Electronic Division, Bangalore, for discussions. Further in the event of order, during approval of the Vendor documents by Customer, Vendor shall accompany BHEL representative for discussions.

4. This specification does not prohibit any vendor to submit their offer along with clause wise deviation from the specification.



A4-11

CE/416/NPCIL/220VDC/B

REV 00

PAGE 01 OF 02

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SECTION- B

Clause AA

Pre-Qualification Requirements (PQR) of Bidders for 220V DC charger system:

- a) The bidder should be a reputed manufacturer who have been in the field of manufacturing DC Chargers for not less than 10 years and have designed, engineered, manufactured and supplied 220V DC Chargers which are equal to or superior than specification provided in this document, to atleast two nuclear / thermal power units which are in successful commercial operation for at least 2 years under similar condition as specified in this document. Supporting documents like PO copies, performance certificates issued by user, MOM for commissioning and handing over of system etc should be provided.
- b) Original Equipment Manufacturers (OEM) based outside India, who are submitting offer for this tender, shall have authorized representatives in India for support related to Documentation, technical support, troubleshooting, Erection, Commissioning & any other co-ordination work. Letter from OEM detailing Indian representative organization details should be provided.
- c) OEM to furnish an undertaking letter that in case of change in Indian representative / agent, OEM shall continue to support the supplies made through this tender.
- d) BHEL shall issue call for service / commissioning with maximum 15 days' notice. Bidder to submit undertaking letter for agreeing to visit project sites within above notice period.



A4-11

CE/416/NPCIL/220VDC/B

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PAGE 02 OF 02

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SECTION- B

Clause - BB

Along with the documents related to PQR above, following details shall also be included in the Offer:

1. Technical literature / datasheets of offered System (as per technical specification Section – C & D) to be submitted.
2. Submit List of Projects for which offered system is supplied, commissioned and working satisfactorily for more than 2 years (as per PQR requirements).
3. Name & registered address of the Indian branch office or Indian representative for support of E&C and after sales service with Organization chart.
4. Bidder shall have facility in India for Engineering activities, preparation of Documents, trouble shooting and commissioning of the system. Documents substantiating these to be submitted.
5. If Bidder is not Original Equipment Manufacturer (OEM), then Bidder to include Authorization letter from OEM for Design, Engineering, Manufacture, Testing, supply, Erection, Commissioning and Servicing of the offered System. This Authorization letter provided by OEM to Bidder shall indicate the Type and Duration of Validity of the agreement.

Important note: All bidders, irrespective of being already registered/approved by BHEL/NPCIL, should furnish all documents mentioned in Section-B failing which their offer is liable to be rejected.



A4-10

CE/416/NPCIL/220VDC/SOS

REV 00

PAGE 01 OF 03

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SECTION-C

SCOPE OF SUPPLY

REVISION: 00

APPROVED

RAJASEKAR K

PREPARED

AMIT KR SHARMA

ISSUED

416

DATE

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A4-11

CE/416/NPCIL/220VDC/SOS

REV 00

PAGE 02 OF 03

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1. SCOPE OF SUPPLY

A) Main item supplies shall consist of following:

Sl no	Description of Item	Quantity for KAPP unit 3&4	Quantity for RAPP unit 7&8
1	Float cum Boost Main charger (90Amps)	4nos	4nos
2	DCDB	4nos	4nos
3	BHMS system	4nos	4nos
4	ETHERNET MODBUS connectivity to DCS (incl all items required)	4nos	4nos
5	Erection supervision, commissioning, site testing and handing over	4sets	4sets

B) Mandatory spares: The Spares are to be supplied as below separately for each project:

- 10% of the plug-in sub assemblies/units or at least one unit, whichever is more.
- 10% of the components like thyristors/transistors not mounted on the sub assemblies/units or at least one component whichever is more.

The vendor shall give a list of spares with the offer based on the above.

The bidder shall provide unit rate of each main item like main charger, standby charger, DCDB, Switch Fuse unit, BHMS System, Erection supervision & commissioning charges in price bid. Unit rate of each item of mandatory spares must be provided in price bid.

2. Training:

4 Nos. of NPCIL engineers shall be trained at supplier's works for operation and maintenance. To & fro conveyance charges, boarding & lodging charges will be borne by the NPCIL. Training charges, if any, shall be mentioned in the offer. If training is free, the same shall also be mentioned in the offer clearly.

3. Documents to be submitted:

3.1 Following documents shall be furnished to BHEL as a minimum, apart from any other documents required to be submitted as called elsewhere in the specification.

3.2 **Along with the Technical offer:** For technical evaluation, vendor must send one (01) set of the following documents in hard copy.

- Single line diagram, Circuit diagrams, schematic drawing
- GA drawings, weight, outline dimension
- Fault co-ordination details
- Technical write-up / Technical literature / Catalog of each major component
- Wiring diagram/interconnecting arrangement details
- Complete Bill of Material with make & Model
- Clause-wise compliance/deviation list, clearly indicating compliance/deviation to all the clauses mentioned in this specification

NOTE: - Later no explanation on noncompliance or deviation, stated or observed, may be acceptable. Incomplete offers (without documents / not relevant documents as mentioned above) will be technically rejected without any notice.



A4-11

CE/416/NPCIL/220VDC/SOS

REV 00

PAGE 03 OF 03

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3.3 After placement of Purchase Order within 1 week: For BHEL/Consultant/Customer approval, Vendor must send Eight (8) sets of the following documents in hard copy & one (01) CD in soft copy, for each project.

- a) All documents Sl. No 01 ~ 13 as above.
- b) Interfacing diagram & cable type details used or suggested.
- c) Quality Plan format enclosed as part of the specification.
- d) Test Procedure: The equipment shall be tested as per approved test procedure.

3.4 After Type Test but before Inspection : For BHEL/Consultant/Customer approval, vendor must send two (2) Sets of the following documents in hard copy & one in soft copy.

- 01. Type test reports/Certificates as per specification/approved QP
- 02. Preliminary Instruction /O&M Manual

3.5 Along with the materials being dispatched: Vendor must send five (5) sets of the following “As Built & Approved” status documents four (4) in hard copies & one (1) in soft copy.

- (a) Instruction/O&M Manual
- (b) Bill of Material
- (c) Data Sheets
- (d) Technical literatures/Catalogs
- (e) Drawings GA/layout/wiring/interconnection/schematic, etc.)

Instruction/O&M Manual: It shall include

- a. General Information
- b. Principal technical data.
- c. Description of components.
- d. Description of various controls with block schematics.
- e. Operating instructions.



A4-10

CE/416/NPCIL/220VDC/TR

REV 00

PAGE 01 OF 20

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TECHNICAL SPECIFICATIONS OF 220V DC CHARGER

REVISION: 00

APPROVED

RAJASEKAR K

PREPARED

AMIT KR SHARMA

ISSUED

416

DATE

29 / 8 / 15



A4-11

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REV 00

PAGE 02 OF 20

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1.0 SCOPE

The scope of this specification covers the design, manufacture, testing, supply, delivery and commissioning of the Battery Chargers for KAPP 3&4 and RAPP 7&8 projects.

2.0 CONTENTS

The requirements of this specification are presented under following section headings.

Description	Section
Applicable standards, specifications and drawings.	3
Materials, processes and workmanship.	4
General functions and description.	5
Design requirements.	6
Inspection, tests and reports	7
Tests	8
Packing and Shipment	9
Information required with the bid	10
Technical details required with the bid.	Annexure-A
Quality Assurance Plan (Sample)	Annexure-B
Details of alarms and indications	Annexure-C
Block diagram of charger	Annexure-D
Feeder list and battery sizing	Annexure-E

3.0 APPLICABLE STANDARDS, SPECIFICATIONS AND DRAWINGS

All documents listed below constitute a part of this specification. In the event that certain requirements of specifications, drawing or data listed below conflict with the requirements of specification, the requirements of this specification shall govern.

3.1 Applicable Standards

- IS-11171 : Dry type power transformers
- IS-11794 : Lamination for transformers & inductors for telecom & electronic equipment
- IS-3895 : Monocrystalline semiconductor rectifier cells and stacks
- IS-4540 : Monocrystalline Semiconductor rectifier assemblies and equipment
- IS-5051 : Relays for Electronics and Telecommunication Equipment
- IS-60947 : Specification for Low-Voltage Switchgear and Control gear
- IS-60898 : Miniature circuit breaker
- IS-14901 : Semiconductor Devices - Discrete Devices and Integrated Circuits
- IS-2705 : Current transformers
- IS-3156 : Voltage transformers
- IS-5553 : Reactors (Inductors)
- IS-13703 : Low voltage fuses for voltages not exceeding 1000 V AC or 1500 V DC
- IS-1248 : Direct Acting Indicating Analog Electrical Measuring Instruments & Accessories
- IS-5786 : Fixed resistors general purpose, low power
- IS-7788 : Single phase traction power converters
- IEC-60146 : Semiconductor converters
- IS-8872 : Variable resistors
- IS-2786 : Ceramic dielectric capacitors
- IS-4317 : Aluminium electrolytic capacitors with non solid electrolyte
- IS-4794 : Push button switches
- MIL 883G : Test method standard: Microcircuits
- IS-694 : PVC insulated cables for working voltages up to and including 1100V
- IS-513 : Cold rolled low carbon steel sheets and strips
- IS-6005 : Code of practice for phosphate coatings of iron and steel
- IS-5 : Colour for ready mixed paints



A4-11

CE/416/NPCIL/220VDC/TR

REV 00

PAGE 03 OF 20

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- IS-9000(Part-III) :Basic environmental testing procedure for electronic & electrical item: Dry heat test
- IS-9000 (Part V) :Basic environmental testing procedures for electronic & electrical items: Damp heat (cyclic) test
- IEEE-946 : IEEE recommended practice for the design of safety related DC auxiliary Power systems for Nuclear Power Generating Station
- IEEE-650 : IEEE standard for qualification of Class-1E static battery chargers and inverters for Nuclear Power Generating Station
- IEEE-344 : IEEE recommended practices for seismic qualification of Class 1E equipment for Nuclear Power Generating Station

3.2 Applicable Specifications

- PP-E-1443: Specification for the manufacture of single sided, double sided and multi layered printed wiring boards.
- PP-E-2061: Specifications for requirements of components for instrumentation items.
- PC-E-409: Technical specification for (polyamide) & accessories for non radiation area for 700MWe.
- PC-E-710 : Engineering Standard for Electromagnetic Compatibility Qualification of C&I Equipment

4.0 MATERIALS, PROCESSES AND WORKMANSHIP

4.1 Materials and Processes

The materials, processes and standard parts which are not specifically described herein and which are necessary to meet this specification shall be of first class commercial quality and in accordance with the good practice pertinent to the equipment's. All components used shall be "type approved" or shall have gone through a satisfactory quality assurance test programme. As far as possible components shall be adequately derated so as to increase the system reliability. Use of integrated circuits is preferred. All the semiconductor components shall be of silicon.

4.2 Workmanship

The workmanship shall be of high industrial quality to ensure satisfactory operation and service life of 40 years in accordance with the provisions of this specification. The units shall be modular and access to any portion of the unit shall be easily available for maintenance and adequate tests points shall be provided for trouble shooting purposes.

4.3 Tropicalisation

The design, material used, manufacturing and assembly shall be done to render the parts and assembled equipment moisture, fungus, microorganism and termite resistant. Proper surface treatment of the moisture and fungus susceptible parts of the component and their assembly shall be done. Care shall be taken during treatment to avoid its effect on the performance of the component and its assembly.

5.0 Environmental conditions

Normal operating conditions

Ambient temperature from 8°C to 45°C and relative humidity up to 90 %

Occasional/Storage conditions

Ambient temperature from 5°C to 55°C and relative humidity up to 95 %



A4-11

CE/416/NPCIL/220VDC/TR

REV 00

PAGE 04 OF 20

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6 System Concept of 220V DC charger

The Battery Charging equipment shall comprise of Charger-I & Charger-II for each unit (refer charger block diagram). The input supply to the DCPS shall be fed through a two winding transformer to ensure proper galvanic isolation from the input source. The DCPS shall be able to produce output voltage ranging from 220V DC to 341V DC adjustable through potentiometer. The DCPS shall have soft start feature. 12 PULSE SCRs shall be used for converting AC to DC.

There shall be two selector switches on front panel, one switch for Auto/Manual mode selection and second switch for Boost / Equalising / Float operation.

6.1 General features of Float cum boost (FCB) MAIN CHARGER:

The DCPS shall have provision for operating satisfactorily in any of following conditions:

6.1.1 Supply of load at 220V DC (nominal) and float charging of batteries:

The DCPS shall supply control loads at 220V DC nominal and simultaneously trickle charge the battery at float voltage of 242V. Diode Voltage Regulator (DVR) in series shall be used so that voltage in the range of 209V DC to 235V DC is available at DC output bus after the DVR for supplying the load and simultaneously float charge the battery at 242V. DVR shall be cut-off at the outage of DC power supply while battery is getting discharged. A bypass switch shall be provided which will bypass the DVRs so that direct charger output is available at DCDB

6.1.2 Supply of load at 220V DC (nominal) & Boost charging of Batteries at 2.4VPC:

Following the loss of AC supply to the 220V DCPS, the Battery will feed the power to 220V DC loads. The discharged Batteries are required to be recharged. The DCPS shall supply control loads at 220V DC (nominal) and simultaneously automatic boost charge the Batteries at boost voltage of 264 VDC. Diode Voltage Regulator (DVR) in series shall be used so that voltage in the range of 198V DC to 234V DC is available at DC output bus after the DVR for supplying the load and simultaneously boost charging the Battery at 264 VDC.

The DCPS shall have provision for charging batteries satisfactorily in both Manual and Automatic Mode with the help of selector switch provided on the DCPS front panel

6.1.2.a Automatic Mode:

In the automatic boost charging mode, the DCPS shall charge the batteries with battery charging a preset current limit of 10% of rated battery capacity. The DCPS voltage shall be set at 2.4V/cell i.e. 31.2V for 13cells. As soon as the battery voltage reaches at 258.5V, a timer shall start counting for a preset duration. Voltage shall remain constant at 264V during the preset duration. Once the preset time period is over, the charger voltage shall automatically come down to float voltage of 242V. The timer shall have provisions for setting time duration of 4hrs / 6 hrs / 8hrs / 10hrs / 12hrs / 14hrs / 18hrs.

6.1.2.b Manual Mode:

In the manual boost charging mode the boost charging voltage shall be adjustable through voltage adjustment potentiometer to the required voltage in the range of 200V to 264V. The DCPS voltage shall be set at 2.4V/cell i.e. 264V. The DCPS shall charge the battery with current limit of 10% of battery rating. The DCPS shall be manually stopped after three consecutive hourly voltage readings are constant at specific gravity of $1.2 \pm 0:0005$.

A bypass switch shall be provided which will bypass the DVRs so that direct charger output during boost charging is available at DCDB



A4-11

CE/416/NPCIL/220VDC/TR

REV 00

PAGE 05 OF 20

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6.1.3 Supply of Loads at 220V DC (nominal) & also Equalizing Charging of Batteries:

Equalizing charging of lead acid batteries shall be done in the following modes:

6.1.3.a Automatic mode:

In the automatic equalising charging mode, the 220V DCPS shall have provision for charging at constant potential mode i.e. 253V (2.3V/cell). The current limit shall be set at 5% of rated battery size. A facility for equalizing charging with preset timer shall be provided with adjustable duration of 2hrs / 4hrs / 6 hrs / 8hrs / 10hrs / 12hrs. After the preset time the DCPS shall change over to float mode and equalizing charging shall be stopped automatically.

6.1.3.b Manual mode:

In the manual equalizing charging mode provision for equalizing 220V DC lead acid battery shall be made with features as mentioned for automatic mode but without a preset timer. The equalizing charging shall be stopped manually after the required duration as per battery manufacturer's recommendation.

6.1.4 Initial Charging of Batteries:

220V DCPS shall be able to provide initial charge to the batteries at constant current of 12% of battery size till the individual cell voltage in the battery bank reaches 2.4V DC. Further 51 amps constant current shall be provided till the battery gets fully charged. Total AH to be fed to the battery shall be 6 times of battery size. DC voltage may reach up to 341V

6.3 Switch Fuse Unit: Not Applicable

6.4 Design Parameters

6.4.1 INPUT: The DCPS shall be suitable for operation on a nominal input sinusoidal symmetrical supply of 415V, 3 phase, 3 wire, 50 cycles. The steady state input voltage and frequency variation will be as below.

Voltage variation	+ 10%
Frequency variation	+ 5%
Combined voltage & frequency variation-	+ 10%
Voltage unbalance	+ 3%

The DCPS shall be capable of maintaining the following at the input side:

Input current harmonics	<12%
Power factor	>0.8



A4-11

CE/416/NPCIL/220VDC/TR

REV 00

PAGE 08 OF 20

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6.4.2 OUTPUT OF CHARGER

Output voltage 220V DC nominal

Output voltage range:

- i) Load 209V DC to 235V DC after DVR during float mode
198V DC to 235V DC after DVR during boost mode.

ii) Battery Charging

- a) Float voltage 242V(2.2V / cell)
b) Boost voltage 264V(2.4V / cell)

DESIGN PARAMETERS FOR CHARGER

Steady state regulation Output voltage	± 1% of set voltage
Transient regulation (On sudden application or removal of 100% load)	± 20% of set voltage
Recovery time of voltage from transient condition to rated output voltage	500ms
Ripple content in DC output	Less than 2% (with battery disconnected)
Boost charging current limit	10% of rated full load current
Type of earthing	Floating w.r.t ground
Maximum noise level	75 dB
Efficiency	≥ 80% at full load and nominal input / output
Overload Capacity	: 110% for 30mins ; : 150% for 1 minute : MCB Clearance as per section 8.2.10

6.5 Protection Controls & Power:

6.5.1 Protection:

D.C Output Side: The circuit interruption on DC side shall be by means of DC CB.

The vendor shall provide.

- a) **Instantaneous trip protection** in the event of a short circuit if the DCPS is connected with reverse polarity to the station battery.
- b) **Instantaneous trip protection** to provide over current protection to each rectifier / thyristor. Fuses shall be provided for this protection, they shall be specifically designed for semiconductor protection. These fuses shall be properly co-ordinate with main output protection as described in a) above. All the fuses shall have an alarm contact with trip indication or alarm fuse in parallel with the power fuse having alarm contact with trip indication. In addition to fuse protection, thyristor pulse blocking method shall be adopted.
- c) **Over voltage trip protection** by blocking the Rectifier and tripping the input AC CB. The over voltage device shall have continuous setting over the whole range and shall be equipped with inherent time delay so as to be insensitive to transient over voltages (spikes in grid). Contact shall be available for alarm also.
- d) **Overall current limit:** The DCPS shall continue to work on overload of 110% for 30 minutes, 150% for 1minute and 200% for fuse clearance time. Charger may be tripped after above mentioned time duration at specified overload. The current limits shall be fast acting and shall be able to withstand a switched load from no load conditions 10 full load with more than 20% transient over current in the voltage range of 198V to 235V.



A4-11

CE/416/NPCIL/220VDC/TR

REV 00

PAGE 09 OF 20

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- e) Output Contactor shall be tripped when mains have failed, and alarm plus visual indication shall be provided.
- f) Surge and lightning protection dv/dt and di/dt protection for thyristors.
- g) The Supplier may provide any other protection or alarm which is necessary for the reliable trouble free and efficient performance of the equipment

6.5.2 Control Circuits:

Semi-conductors:

All semiconductor devices shall be silicon. All semiconductors shall have heat sinks of sufficient thermal rating so that the junction temperature of the devices will remain within the non-destructive limits with sufficient margin at an ambient of 45Deg C. Silicon Control Rectifier (SCR) shall be used for rectifier. All semiconductor devices shall be adequately derated to prolong the life of devices, but shall not be derated below 0.7 of normal voltage and current or 0.5 of the normal rated power.

Transistors: The transistors are to be derated to as follows:

Collector current: 80%

Any other Voltage: 70%

Diode: The diodes are to be derated to as follows:

Forward current: 50%

Peak reverse voltage: 50%

Control Fuses: All control fuses for protection of semiconductor shall be semiconductor fuse

Capacitors: The use of electrolytic capacitors shall be kept to an absolute minimum and wherever possible tantalum capacitors shall be used. Capacitor voltage shall be derated to 50%.

Terminal Blocks: Terminal block shall be of Polyamide (nylon 6.6) and brass clamping yoke. Fire rating shall be V0 as per UL-94. Current bar shall be of copper alloy.

Resistors: All resistors shall be preferably metal oxide type and in general shall not be rated more than 50% of the manufacturer's rating. Preset Potentiometer shall be used instead of fixed resistors wherever wide range voltage and current adjustments are necessary and shall be provided with locking devices. Wire wound resistors shall be used in snubber circuits and as bleeder resistors. Power of resistors shall be derated to 50%.

Relays: All relays shall be compact, hermetically sealed and dust proof to provide maximum reliability and shall be free from contact deterioration. Freewheeling diode shall be provided as integral part of relay.

Connectors: All connectors shall be suitably plated to provide good contact. The connector shall be designed in a manner to avoid plugging in wrong direction.

Construction: All devices shall be manufactured on a modular basis to enable rapid replacement of a faulty module by a spare module.

Monitor Points: Monitor points shall be provided for rapid fault finding.

Meters: Indicating meters on the front panel of DCPS shall be preferably digital type with Minimum resolution of 1V for voltmeter and 1A for ammeter. All meters shall have full scale accuracy of $\pm 2\%$ minimum.

6.5.3 Power Circuits

6.5.3.1 Transformer/Choke: The power transformer/choke shall be derated to as follows:

Voltage: 90%

Current: 80% (including harmonics)

6.5.3.2 Capacitors: Electrolytic capacitors shall be used for DC purpose and non-electrolytic capacitors shall be used for AC purpose. Capacitor voltage shall be derated to 50%.



A4-11

CE/416/NPCIL/220VDC/TR

REV 00

PAGE 11 OF 20

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6.7.4 LED Indication on DCPS (front panel)

- a) DCPS output voltage high
 - b) DCPS input voltage high / low
 - c) Fuse failure
 - d) N/A
 - e) DCPS output overload (after DVR)
 - f) DCPS output breaker/contactors tripped
 - g) Fan failure
 - h) Equipment over temperature
 - i) Control power supply failure
 - j) Battery on load
 - k) Redundant DCPS not available
- Alarm reset button should be provided on front panel of each charger)

6.7.5 LED ON MIMIC

- a. Input CB ON
- b. Rectifier ON
- c. Output CB ON
- d. Battery CB ON

6.7.6 Besides above following general purpose LEDs shall be provided:

- a. Input RY, VB, BR
- b. Manual Mode
- c. Auto mode
- d. Float charging
- e. Initial charging
- f. Equal ise charging
- g. Boost charging @ 2.4 VPC
- h. Boost charging@ 2.75 VPC
- 1. Timer ON

6.7.7 Meters on DCPS front panel

The following meters shall be provided on the front panel of the DCPS with proper labeling.

1. AC Voltmeter at input
2. AC Ammeter at input
3. Ammeter for battery charging current
4. DC Voltmeter at output
5. DC Ammeter at output
6. N/A

All meters shall be LED 7 segment digital type of size approximately 48 x 96 mm and shall be suitable for flush mounting. Zero adjustment shall be possible from front side. Meters for AC voltage, DC current measurement shall be 4 and ½ digits while meters for AC current and DC voltage shall be 3 and ½ digits. Accuracy of meters shall be 1% full scale or better. All voltage circuits of meters shall have fuses. Meters shall comply IS: 8573.


6.7.8 Remote Display and Annunciation


The parameters listed below shall be converted in the form of 1-5V signals by the supplier. These signals shall be galvanically isolated for 1.5KV. The measurement accuracy shall be + 0.5%. These signals shall be wired to separate terminal block and then connected to communication interface card (Ethernet communication) as mentioned in section 6.6.2. The description and process range of the 1-5V signals to be transmitted are given below.

Description Process Range

1. DCPS input voltage 0-600V AC
2. DCPS input current 0-75A AC
3. Battery charging current 0-100A DC
4. DCPS output voltage 0-40V DC
5. DCPS output current 0-900A DC

5nos of analog signal as shown in charger block diagram shall be provided through dual output (1-5V) transducer for connectivity to DCS and NPCIL system.

				CE/416/NPCIL/220VDC/TR
				REV 00
				PAGE 12 OF 20
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			<p>Double sided PCBs of glass epoxy based, copper laminated type shall be used with high quality soldering and shall be suitably enamel coated for protection against moisture and dust to ensure longer life. The PCB shall be designed to meet the requirement specified in NPC specification PPE-I443 (To be issued to the successful bidder) All PCBs shall be housed in semi draw out modular construction</p>	
			<p>6.8.5 Housing and Foundation: The DCPS cabinet shall be fabricated from cold rolled steel sheets having a minimum thickness of 1.6mm. It shall be bidder's responsibility to select suitable sheet thickness (especially for load bearing doors) to avoid any slagging or bending. Fabrication and design of the enclosure shall be such as to make the complete assembly rigid; self supporting and free from magnetic vibration, twist and Weave. Enclosure shall be indoor type, floor mounting, suitable for forced air cooling and shall be completely dust and vermin proof. All steel parts including walls, doors and roof shall be adequately supported and stiffened to prevent flexing. All removable panels supplied for access to die interior of the housing shall be equipped with suitable captive fastenings and shall be of a size that can be conveniently handled by one man.</p>	

		 A4-11		CE/416/NPCIL/220VDC/TR
				REV 00
				PAGE 13 OF 20
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			<p>6.8.7 Enclosure ventilation and illumination: Enclosure shall be fan cooled, for better heat dissipation and to allow a reduced size of cubicles. Arrangement shall be provided to circulate the air homogeneously throughout the compartment. Louvers provided for ventilation shall be located in the compartment doors and bolt-on panels. The louvers shall be suitably screened or fitted to prevent entrance of vermin etc. Fan failure alarm and indication shall be provided for monitoring the healthiness of fans. Flapper circuit design shall not be used for monitoring of fan failure. The DCPS shall be able to operate satisfactorily even after failure of cooling fan for about 8 hrs on full load. All the materials used for construction shall be such that they will not independently support combustion. Round compact fluorescent lamp of 20 watts, 240V AC, 1 Ph shall be provided with door switch. Thermostatically controlled space heater and 3pin 5A receptacle with plug shall be provided in each charger panel.</p>	
			<p>6.8.8 Cabling: 6.8.8.1 Cable supports and arrangements: Cable entry shall be from top. Suitable termination arrangements and support shall be provided inside the DCPS. Suitable termination arrangements shall be provided including cable lugs, glands and supports inside the DCPS. The cable lugs shall be of the crimping type. All internal power wiring shall have crimped lug termination.</p> <p>6.8.8.2 Bus Bars: Hylum barriers shall be provided between bus bars of opposite polarity. Adequate space shall be given for maintenance. Cu Bus Bar of suitable rating for connecting Charger to DCDB shall be provided ensuring negligible voltage drop.</p>	



A4-11

CE/416/NPCIL/220VDC/TR

REV 00

PAGE 14 OF 20

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6.8.9 Terminal blocks and small wiring:

Wiring of electronic circuits shall be 250 volt grade 1.5 sqmm minimum. Wiring between terminals of various devices shall be point to point (no wire splitting or Connections with wires trunked). It shall be so arranged that instruments or devices may be removed and/or services without unduly disturbing the wiring. Each wire shall be identified at both ends with wire numbers corresponding to the numbers shown in the supplier's drawings. Wire marks used shall be non-deteriorating type. All control wiring shall be adequately segregated and protected from fault.

Provisions shall be made for grounding voltage and current transformer neutrals where required. Wiring affected by stray electromagnetic fields shall be suitably shielded or run as twisted pairs wherever applicable

Terminal blocks shall be grouped by services and segregated according to circuit voltage and field designation. Where schematic diagrams show more than one wire to be connected to any wiring point, a sufficient number of terminals jumper together shall be provided to allow any one wire per terminal on the outgoing side of the terminal block. 20% spare terminals, suitably distributed shall be provided. Connections to terminal blocks shall be easily removable for testing purposes.

The cabinet shall be provided with two nos. suitably located grounding terminals to connect 4/0 AWG copper ground conductor. Each terminal shall comprise of two bolt drilling with M10 GI bolts and nuts to receive grounding connection. All non-current carrying metal parts shall be ended to a ground bus of copper.


6.8.10 PAINTING

6.8.10.1 Painting procedure: On completion of fabrication, all steel work shall undergo following process

- a) Pre-treatment by seven tank process.
- b) Under Coat and painting.

6.8.10.2 Pretreatment. by seven tank process: Heavy deposits of grease, oil and rust shall be removed manually.

- **Degreasing:** Surface cleaning to remove oil, grease, dirt and swerve from assemblies shall be done by either of following methods:
 - a) Trichloroethylene cleaning as per.clause 7.120 of IS:6005 OR
 - b) Alkaline cleaning as per clause 7.1.3 of IS-6005.
- **Derusting:** Rust may be present after degreasing owing to exposure' to corrosive conditions during manufacture. Scale may be present from operations during manufacture. It is therefore, necessary that rust be removed before application of phosphate treatment. Derusting shall be done by chemical treatment method as per clause no. 8.1.2 of IS-6005. Manufacturer may adopt either of the following methods:
 - a) Sulfuric or hydrochloric acid pickling as per clause no. 8.1 .2.1 of IS.6005 OR
 - a) Phosphoric acid pickling as .per IS-6005.
 - b) Duplex sulfuric and phosphoric acid process as per clause no. 8.1 .2.3 of IS-6005

				CE/416/NPCIL/220VDC/TR
		A4-11		REV 00
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			<p>6.8.11 Equipment Identification Name plates shall be provided on the door of the compartment of each set of equipment to identify the equipment obtained therein. Nameplates shall also be provided on the face of the panels or doors to identify all meters, relays etc. Tag or nameplate shall also be provided within the compartments to identify such individual equipment (which has an equipment number) such as relays etc. Name plates shall be held by self-tapping screws. The size of nameplates shall be approximately 20mm X 75mm for equipment and 40mm X 150mm for panels. The identification shall consist of the official name of the equipment with the equipment number below the name. Wherever necessary, the labels shall be provided to describe the function of an item of equipment or to give warning against mal-operation. Attached to the exterior of the cabinet shall be nameplate as per approval of NPCIL.</p>	



A4-11

CE/416/NPCIL/220VDC/TR

REV 00

PAGE 16 OF 20

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6.8.12 Mimic Diagram:

Mimic Diagram made of anodized aluminum or plastic material which can be easily cleaned shall be provided on the panel. It shall be fixed by screws.

6.9 Tropicalization: The supplier shall provide details of his intentions with regard to tropicalisation, including details of any special features for the following items:

- Transfonners
- Relays
- Wiring
- Terminals
- Rectifiers
- Controller Thyristor
- Contactors

6.10 EMC Testing: The 220V DC main battery charger shall be tested for Electromagnetic Compatibility as per PC-E-710 on “Electromagnetic compatibility qualification of C&I equipment”.

7.0 INSPECTION TEST & REPORT

2.17.1 Quality Surveillance & Inspection:

The vendor shall allow access to the M/s NPCIL or his authorised representative at all reasonable time, during manufacture, assembly, testing and inspection to premises in which work is being carried out. The supplier shall provide all the testing and inspection services and facilities as required. Supplier's shop inspection shall be under the control of a competent Chief Inspector who primacy responsibility is inspection reporting directly to Management.

The inspection shall be carried out in a manner satisfactorily and shall be subject to approval by the Purchaser. A Quality Assurance Plan (QAP) is enclosed in Annexure to this specification. Vendor shall prepare QAP based on the QAP enclosed herewith and submit to purchaser for approval.

Manufacturer shall carry out all inspection and tests, apart from that all work covered by this specification shall be subject to quality surveillance by the NPCIL/BHEL or his authorized representative. Quality Surveillance by the Purchase or his authorized representative shall not relieve the supplier of the inspection duties called herein. In addition to the tests performed by the supplier, the purchaser shall have the right to ask for additional inspection or testing as deemed necessary and the additional cost of such tests will be borne by the NPCIL.

In the event of any failure to meet the inspection or test requirements specified herein, the supplier shall notify NPCIL/BHEL or their authorised representative. The supplier must obtain permission from the purchaser before repair is undertaken. If repairs, including redesign, are likely to affect the results of tests previously completed, appropriate re-inspection and re-testing shall be carried out .The quality control procedure to be followed to ensure a satisfactory repair shall be subject to approval by Purchaser.

The supplier shall provide NPCIL/BHEL or their representative with complete set of detailed drawing which will be used by them to assist in the inspection during construction of the equipments and which will be returned after the completion of the contract. Inspection shall not be limited to the end product only. Facilities shall be provided for inspection during various stages of manufacture and as agreed between the supplier and the purchaser.



A4-11

CE/416/NPCIL/220VDC/TR

REV 00

PAGE 17 OF 20

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If there are changes in the components or design/type already type tested and design type offered against this specification, the purchaser reserves the right to demand repetition of tests without any extra cost before commencement of supply. The bidder shall bring out in his offer all such changes made in components, materials, design etc. as the case may be and likely affects of such changes on type qualification

8.0 TESTS

The supplier shall carryout tests to show that the equipment has been satisfactorily designed and manufactured and will perform to the standards required by this specification. If some tests mentioned cannot be carried out at supplier's works the same shall be carried out at site. In such a case, the supplier shall indicate the procedure of the test. If the equipment does not pass the test, it will be the supplier's responsibility to bring the equipment to the guaranteed figure or replace the faulty equipment at his cost. Any special equipment required for testing, like meters or relays, etc. if not available at purchaser's site office shall be supplied by the supplier.

8.1 Component Testing:

All semiconductors and other discrete components to be used in the DCPS shall be screened. These shall be procured from reputed manufacturer with certificate of compliance to recent relevant specifications. Component testing shall be done as per MIL standard-883C. Active component like ICs, transistors, diodes shall be subjected to baking at maximum storage temperature for 24 hours. Then the component shall be subjected to temperature cycles between minimum storage temperature and maximum storage temperature for 10 cycles. Duration of each cycle shall be 15 minutes. Transition time from one cycle to another shall be 5 minutes. After the temperature cycling functional testing shall be done on 100% active component

Passive components like resistors, capacitors, relays, control transformer shall be subjected to baking and temperature cycling as above. However functional testing shall be done on sample basis for passive components. Details of the test to be conducted shall be listed in "Quality Assurance Plan" to be submitted by the vendor after award of contract. The components to be tested are shown below. Suppliers shall test all the components used and not necessarily only the components listed below.

List of Components to be tested:

- | | |
|-----------------------------|---|
| (i) Electrolytic Capacitors | (ii) Diode |
| (iii) Circuit Breaker | (iv) Contactors |
| (v) Switches | (vi) Meters |
| (vii) Control Transformers | (viii) Fan Supply transformers |
| (ix) Input transformers | (x) DC filter choke |
| (xi) PCBs | (xii) Current transformers |
| (xiii) Shunt | (xiv) Temperature sensor |
| (xv) Control cables | (xvi) Power cables |
| (xvii) DC filter assembly | (xviii) Surge and lightning suppressors |
| (xix) Rectifier assembly | (xx) Fuses |

8.2 Routine tests on system:

Following test shall be conducted on the complete DCPS as per IEC-146 wherever applicable. Five bound volumes containing copies of these test reports shall be submitted to the NPCIL. Shipping release will be issued only after receipt of three bound volume of test reports. Supplier shall keep a record for a period of five years after completing the job.



A4-11

CE/416/NPCIL/220VDC/TR

REV 00

PAGE 18 OF 20

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1. Visual inspection for quality of workmanship, finish, dimensional checks & degree of protection.
2. Verification of compliance with approved drawings including checking of BOM & wiring.
3. Connection checking & overall dimension checking of modules, bins and panels.
4. All interlocks and sequence operation of circuits such as indications on front panel, alarms and trips shall be shown.
5. Voltage regulation of rectifier for input voltage variation at 415V (-) 10% / 415V (+) 10%.
6. Undershoot & overshoot voltage of rectifier output when 100% load is switched on & off.
7. Overload capability
8. Insulation resistance test.
9. High Voltage test
10. Input in-rush current measurement when DCPS is switched on at rated load.
11. Battery current limiting feature and V-I characteristics of the charger.
12. Test for diode voltage regulator operation
13. Short circuit capability test by connecting 100% load to DCPS & than short circuiting output.
14. Burn in test: DCPS shall be kept on load continuous for a period of 100 hours at nominal input voltage and full output load. Various functional tests mentioned above shall be carried out after burn in test. Burn in test and above functional test shall be conducted on all equipment.
15. Tests to prove functional requirements. Variation of voltages and current limit set values for all modes of charging and checking of accuracy for above settings.
16. Mechanical operation tests on switches, auxiliary electrical and mechanical devices.
17. Checking of equipment overall current limit operation.
18. Electrical control interlock and sequential operation tests
19. Insulation resistance test at 500V DC.
20. High Voltage test at 2000V AC RMS for one minute.
21. Functional tests on auxiliary devices.
22. Alternating current measurements on the input side in all phases at full load and no load including power factor, wave shape and harmonics injected to the system.
23. Measurement of losses and efficiency at full load, 50% and 25% of load rated input/output voltages.
24. Ripple content of DC output at maximum and minimum DC bus voltage and charging conditions under specified input voltage range.
25. All alarms and trips to be checked for satisfactory operation at various loads from zero to full load including specified over load.
26. N/A
27. Noise Level test (max. 75 dB) at 1.5m distance from DCPS.
28. Efficiency of DCPS at full load and rated input / output voltages.
29. Voltage regulation of rectifier for input voltage variation at 415V \pm 10%
30. Ripple content of rectifier output at float voltage & boost voltage.
31. Undershoot and overshoot voltage of rectifier output when 100% load is switched on and 80% load switched off.
32. Battery charging test at boost voltage.
33. Power Factor measurement with 3 Phase PF meter at full load and at rated input voltage.

8.3 Special type test

8.3.1 Environmental Tests

Typical sub assemblies of one DCPS shall undergo environmental testing as mentioned below..

Dry heat test for PCB & sub assembly

Dry heat test as per IS-9000 Part III/Section: 3 test must be conducted at conditions mentioned:

Temperature: 55 \pm 2°C

Relative Humidity: 50% at 35°C

Duration: 4 hours.



A4-11

CE/416/KAPP 3 & 4220VDC/TR

REV 00

PAGE 19 OF 20

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Damp heat test (cyclic) for PCB & sub assembly

Damp heat (cyclic) test as per IS-9000 Part V/ Section 2
Test must be conducted at the conditions mentioned below:

Upper Temperature: $40 + 2$ °C
Relative Humidity : 90% (minimum)
Lower Temperature: $25 + 3$ °C, 98% RH
Relative Humidity : 95% (minimum)
Each cycle is of 12 hours + 12 hours duration
Number of cycles: 2

8.3.2 Temperature rise test by connecting 100% load to DCPS and recording temperature rise by mounting sensors on transformers, choke, SCR heat sink and diode heat sink at 220V DC & 235V DC with doors closed.

8.3.3 EMC test

EMC test shall be conducted on one DCPS.

8.3.4 Preparation and submission of documentation covering reliability analysis, stress analysis, identification of age related and non age related degraded components as per IEEE-650.

8.3.5 Performance of stress test as per IEEE-650.

8.3.6 Branch circuit MCB clearance test: The DCPS shall be loaded at rated load at the output. The DCPS shall be capable of isolating a short circuit in branch circuit through a MCB of 20A, 'C2' curve without tripping the DCPS.

8.4 Test Certificates

8.4.1 All routine and type test certificates including records, performance curves etc. shall be supplied according to the distribution schedule.

8.4.2 The Supplier shall ensure that instruments and gauges to be used for testing and inspection have rated calibration and the accuracy can be traced to National / International Standards. CPS shall be kept on load continuous for a period of 100 hours at nominal input voltage & full output load.

8.5 Tests to be carried out at site

The following tests shall be conducted at site on DCPS as per standards specified. These are however not intended to form a comprehensive commissioning check list as it shall be the Supplier's responsibility to draw up and carryout such a programme after obtaining the Purchaser's approval.

Following typical checks to be carried out at site:

8.5.1 Preliminary Checks

- Check name plate details of all associated equipment according to specification.
- Check for physical damage.
- Check tightness of all bolts, clamps and connecting terminals.
- Check cleanliness.
- Check earthing.
- Check for Lamps, Sockets etc.
- Check for general layout.
- Check provision of all protective relays, meters and transducers as per drawing.
- Check for proper mounting of power devices like thyristors, Diodes etc. on heat sinks.



A4-11

CE/416/KAPP 3 & 4220VDC/TR

REV 00

PAGE 20 OF 20

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8.5.2 Commissioning Checks

- a. Each wire shall be traced by continuity tests and it should be made sure that the wiring is as per relevant drawings. All interconnection between panels / equipment shall be similarly checked.
- b. All the wired terminals shall be meggered to earth.
- c. Megger test between bus bars and bus bars to earth.
- d. Settings of relays, MCCBs, other alarms tripping devices and interlocks as per scheme.
- e. Functional checking of all control circuits including float, equalise and boost conditions, metering and relay circuits.
- f. Insulation resistance test of all circuits.
- g. Measurement of voltage regulation.
- h. No load current and voltage (AC) and voltage and current (both AC. and DC.) at different loads.
- i. Measurement of harmonics injected in to the system for different loading conditions.
- j. Measurements of output voltage ripple contents.
- k. Checking of battery current limit setting and verification of rectifier control circuitry under various conditions of operation.
- l. Test for diode voltage regulator operation.
- m. N/A.
- n. All interlocks and sequence operation of circuits such as indications on front panel, alarms and trips shall be shown.
- o. Functional tests on rectifiers control circuitry.

9.0 PACKING AND SHIPMENT:

The DCPS shall be so packed as not to suffer deterioration damage or breakage during shipment. Packing should be such that the ingress of moisture, dirt and other foreign material can be avoided. Packing method shall be adequate to withstand a period in transit for more two months and storage at site under tropical climate for minimum period of one year without suffering any damage or deterioration. Each package shall be properly labeled to indicate the type and quantity of material it contains, purchase order number, dimensions, weight and any other necessary data to identify the equipment and relate it to the contract. All bolts, nuts, plates, and other small parts shall be shipped in separate boxes. All projecting connections shall be adequately blocked and protected to prevent damage during shipment. The packing of panel shall preferably be done using suitable thickness of plywood.

10.0 INFORMATION REQUIRED WITH THE BID

The bidders shall submit all supporting information and technical data/drawings requested in this specification to permit the evaluating engineer to make a detailed comparison and evaluation of the tenders without the need of the request for further information from the bidder.

Bids which are not consisting of the essential information as mentioned below will not be considered.

1. Annexure-A gives the formats for submission of the technical bid. These annexure shall be filled in fully and shall make the essential part of the proposal of the bidders.
2. The bidder shall submit a brief list of work executed by him to standards and requirements specified in the tender document.
3. The supplier must state the mode of transportation whether by rail or by truck, and what measures will be taken to ensure that the equipment will not be damaged in transit.



A4-10

CE/416/NPCIL/220VDC/SOS

REV 00

PAGE 01 OF 08

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TECHNICAL SPECIFICATION OF DCDB

REVISION: 00

APPROVED

RAJASEKAR K

PREPARED

AMIT KR SHARMA

ISSUED

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DATE

29 / 8 / 15



A4-11

CE/416/NPCIL/220VDC/TR

REV 00

PAGE 02 OF 08

1.0 SCOPE

The scope of this specification covers the design, manufacture, testing, guarantee, supply, delivery and commissioning of DCDB.

2.0 CONTENTS : Requirements of this specification are resented under following section headings:

Description	Section
Applicable standards, specifications and drawings.	3
Materials and workmanship.	4
General functions and description.	5
Design requirements.	6
Inspection and reports	7
Tests	8
Packing and Shipment	9
Information required with the bid	10
Technical particulars required with the BID	Annexure – A
Quality Assurance Plan (Sample)	Annexure – B

3.0 APPLICABLE STANDARDS, SPECIFICATIONS AND DRAWINGS

All documents listed below constitute a part of this specification. In the event that certain requirements of specifications, drawings or data listed below conflict with the requirements of specification, the requirements of this specification shall govern.

3.1 Applicable Standards

IS-5578	Guide for marking of insulated conductors.
IS-8573	Digital DC voltmeters and DC electronic analogue to digital converters
IS/IEC-60898	Electrical Accessories - Circuit-Breakers for Over current Protection for Household and Similar Installations
IS-694	PVC Insulated cables for working voltages upto and including 1100 V
IS-1248	Direct acting electrical indicating instruments
IS-13703 IS-5553	HRC cartridge fuse links up to 650V Reactor
IS-2628	Rotary wafer switches
IS-8872 Part – 1	Non wire wound variable resistors (potentiometers)
IS-3156	Voltage transformers
IS-8909	Wire wound resistors
IS-3961	Recommended current ratings for cables
IS-4007	Terminals for electronic equipment
IS/IEC-60947-3	Heavy duty air break switches and composite units of air break switches and fuses for voltages not exceeding 1000V AC or 1500V DC.
IS-14901	Methods of measurement on semiconductor devices
IS-4540	Monocrystalline semiconductor assemblies and equipment
IS-5469	Code of practice for use of semiconductor function devices
IS/IEC-60947-1	General requirements for switchgear and control gear for voltage not exceeding 1000V.
IS/IEC-60947-2	Moulded case circuit breakers Relays Transistor Capacitor
IS-5051	Relay
IS-14901	Thyristors
IS-590	Capacitor
IS-5	Colours for Ready Mixed Paints and Enamels.

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A4-11

CE/416/NPCIL/220VDC/TR

REV 00

PAGE 03 OF 08

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IS-9000-Part-III	Basic environmental testing procedure for electronic and electrical items: Dry heat test.
IS-9000-Part-IV	Basic environmental testing procedure for electronic and electrical items: Damp heat (cyclic) test.
IS-4000	High strength bolts and steel structures.
IS-737	Wrought aluminum and aluminum alloy sheets and strips for general engineering purposes.
IEEE-344	Recommended practices for seismic qualification of Class 1E equipment for Nuclear Power Generating Stations.
MIL-STD-285	Attenuation measurements for enclosures, Electromagnetic shielding for electronic test purposes
IEEE-299	IEEE standard method for measuring the effectiveness of electromagnetic shielding enclosures.
IEC-61000-5-7-2001	Installation and mitigation guidelines- Degrees of protection provided by enclosures against electronic disturbances (EM code) (10KHz to 40GHz).

3.2 Applicable Specifications

PC-E-249	Technical specification for ground fault detection system.
PC-E-248	Technical specification for MCB status monitoring system.
PC-E-410	Technical specification for screw clamp type and screw less spring clamp type terminal blocks and accessories for non radiation area.
PP-E-2061	Specifications for requirements of components /equipment for instrumentation items.
PC-E-793	Guidelines for Derating of electronic components
PC-E-710	Engineering Standard for Electromagnetic Compatibility Qualification of C&I Equipment

5.0 GENERAL FUNCTION AND DESCRIPTION

5.1 Function of class I 220V DCDB panel is to distribute 220V DC to DDCMIS panels, to supply flasher power to indicating lamps, to detect the ground fault as well as to monitor the status of all Miniature Circuit Breakers (MCBs) mounted in these power supply distribution panels.

Technical requirements of MCB, Moulded Case Circuit Breaker (MCCB), handswitches, indicating meter and indicating lamps mounted in various MCCPSD panels are given in section no. 6.6 of this specification.

Technical requirements of the ground fault detection system are covered in NPCIL specification no. PC-E-249.

Technical requirements of the MCB Status Monitoring System (MCB SMS) are covered in NPCIL specification no. PC-E-248. Each panel shall house the Local Control Module (LCM) and auxiliary contact of each MCB shall be wired to LCM of MCB SMS. MCCPSD shall be able to work satisfactorily under the environmental conditions mentioned in earlier sections of charger.

5.2 Description of 220V DCDB Panels

220V DC Main buses shall be provided with green indicating lamps and shall be equipped with Earth Fault Sensor (EFS). Scanner shall be provided for monitoring the EFSS. Insulation monitoring device and Scanner shall be provided with common hand switch for temporary isolation. 220V DC buses should be equipped with 2 pole Moulded Case Circuit Breakers (MCCB) rated as per suitable charger rating (refer feeder list). Miniature circuit breakers (MCBs) of various ratings (as mentioned in feeder list) shall be mounted in DCDB panel. All the sub-buses (if any) shall be provided with "no voltage" relays. Contacts of these no voltage relays initiate no voltage alarm in control room thru DCS system.



A4-11

CE/416/NPCIL/220VDC/TR

REV 00

PAGE 04 OF 08

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6.6 Equipment

6.6.1 Miniature Circuit Breakers

a. Sub-bus Miniature Circuit Breakers (MCB): 220V DC miniature circuit breakers shall be of 2 poles. They shall have one change over auxiliary contact rated for 0.5 A at 220V DC. These MCBs supply power to mixed loads such as relays, lamps and solenoid valves. Therefore, tripping characteristics shall be of medium delay (C characteristic). MCBs shall have breaking capacity of 1 KA. MCBs shall be fitted with mechanical „ON“ and „OFF“ indicators. MCB shall be generally as per IS/IEC-60898. Insulation resistance shall be more than 100 mega ohms at 500V DC.

b. Bus Circuit Breakers (CB): 220V DC moulded case circuit breakers (MCCB) shall be 2 pole without any auxiliary contact. Tripping characteristic shall be of medium delay („C“ characteristic). MCCB shall have breaking capacity of 5 KA. CBs shall be fitted with mechanical „ON“ and „OFF“ indicators. MCCBs shall be generally as per IS/IEC-60947-2. Tripping characteristics of these bus MCCBs shall be coordinated such that the down stream MCBs shall trip upon occurrence of fault at down stream with out affecting these bus MCCBs. Also the up stream MCCBs shall be of higher rating to prevent them from tripping before these bus MCCBs trip. Insulation resistance shall be more than 100 mega ohms at 500V DC.

6.6.2 Hand Switches : Hand switches shall be 1 A rated at 220V DC.

6.6.3 Indicating Meters All meters shall be LED 7 segment digital type of size approximately 48 x 96 mm and shall be suitable for flush mounting. Zero adjustment shall be possible from front side. Meters for AC voltage, DC current measurement shall be 4 and ½ digits while meters for AC current and DC voltage shall be 3 and ½ digits. Accuracy of meters shall be 1% full scale or better. All voltage circuits of meters shall have fuses. Meters shall comply IS: 8573.

6.6.4 Indicating Lamps Indicating lamps shall be LED assemblies and of low voltage type. Series resistors / rectifiers for DC / AC may be fitted if required.

6.6.5 Bus Bars Bus bars shall be of electrolytic grade copper and shall have continuous current carrying capacity of suitable for charger rating specified in feeder list. Bus bars shall be rigidly braced to withstand the fault currents. Bus bar and link joints shall be made as per the latest modern practice. All joints as far as possible shall be bolted type. Supports used for the bus bars shall have adequate thickness and strength to withstand thermal, electrical and mechanical stresses during short circuits and they should be suitable for terminating cable of size as specified in feeder list. Bus bars for terminating incoming cables shall be placed horizontally. Marking and arrangement of bus bars shall conform to IS: 5578. Temperature at any point on the bus bar shall not exceed 85DegC during continuous operation at rated current at 45Deg C ambient.

6.6.6 Control Equipment

6.6.6.1 Semi-conductors: Refer charger specification section cl 6.5.2

6.6.6.2 Control Fuses : All control fuses for the protection shall be slow blow type Category 1A long life grade suitable for 85Deg C operation.

6.6.6.3 Capacitors : Preferably all capacitors shall be tantalum.

6.6.6.4 Terminal Blocks: Terminal blocks shall be of Polyamide (nylon 6.6) and brass clamping yoke. Fire rating shall be V0 as per UL-94. Current bar shall be of copper alloy.

6.6.6.5 Resistors

All resistors shall be preferably metal oxide type and in general shall not be rated more than 50% of the manufacturer’s rating. Potentiometer shall be used wherever wide range voltage and current adjustments are necessary.



A4-11

CE/416/NPCIL/220VDC/TR

REV 00

PAGE 05 OF 08

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6.6.6.5 Resistors

All resistors shall be preferably metal oxide type and in general shall not be rated more than 50% of the manufacturer's rating. Potentiometer shall be used wherever wide range voltage and current adjustments are necessary.

6.6.6.6 Relays

All relays shall be compact, sealed to provide maximum reliability and shall be free from contact deterioration. Relays shall have 2 C/O contacts. The rating of contact for shall be 2 A. All relays shall be instantaneous and plug in type.

6.6.6.7 Monitor Points: Monitor points shall be provided for rapid fault finding.

6.6.7 Printed Circuit Boards: Refer charger specification section cl 6.8.4.

6.6.8 Ground Fault Detection: Ground fault detection shall be as per specification no. PC-E-249. The supplier shall mount the GFD system suitably on the panels, wire and integrate with main charger panels and ensure proper functions of the GFD system.

6.6.10.3 Housing and Foundation : In its proposed location, panel shall have access from its front as well as rear. Suitable gland plates of minimum 2.5 mm thickness shall be provided for cable entry. Cable entry shall be from bottom of the panel. Refer charger specification section 6.8.5

6.6.10.4 Compartment doors and barriers Barrier between compartments shall be designed such that it is not possible to accidentally touch live parts in adjacent compartment while working on equipment in a particular compartment. All doors shall be provided with good quality industrial locks and handles. Hinges shall be concealed type. Doors shall be provided with sponge gaskets for effective dust proofing. Doors shall open only 90 degree. All locks of doors of panels shall have a common key.

6.6.10.5 Enclosure ventilation and illumination Enclosure shall be natural cooled for heat dissipation. Refer charger specification section cl 6.8.7


6.6.10.6 Cable supports and arrangements

Cable entry shall be from bottom. Suitable termination arrangements shall be provided including cable lugs and supports inside the CCPSD panels. The cable lugs shall be of the crimping type tinned copper. All internal power wiring shall have crimped lug termination. Mounting boards for various control circuits and sub assemblies shall be of adequate thickness to withstand electrical and mechanical stress and vibration.

6.6.10.7 Wiring and Terminations

a. Wire: All small wires shall be stranded copper conductor PTFE insulated, run in plastic wiring channel. Small wiring including instrument transformer secondary wiring shall be 2.5 sq. mm minimum and shall be supplied in accordance with specifications and rating of the charger. Wire size for electronic control shall suit the electronic components used. Wiring affected by stray electromagnetic fields shall be suitably shielded.

b. Terminal Blocks: Terminal blocks shall be screw type. Terminal blocks connected with MCBs of 6A and below shall be 4 sq. mm. TBs connected with 10A, 15A circuit breakers shall be 25 sq. mm. for circuit breakers of 25A and above terminals of 35 sq. mm size shall be provided to terminate the cables. For other control circuits 4 sq. mm TBs shall be used. TBs shall be suitably mounted to allow easy access. TBs shall be grouped by services and segregated according to circuit voltage and field destination. 20% spare terminals suitably distributed shall be provided. Connection to TBs shall be easily removable for testing purposes. TBs shall be mounted not less than 250mm below the top cover.

				CE/416/NPCIL/220VDC/TR
				REV 00
				PAGE 06 OF 08
<p style="text-align: center;">COPY RIGHT AND CONFIDENTIAL THE INFORMATION ON THIS DOCUMENT IS THE PROPERTY OF BHARAT HEAVY ELECTRICALS LIMITED. IT MUST NOT BE USED DIRECTLY OR INDIRECTLY IN ANY WAY DETRIMENTAL TO THE INTEREST OF THE COMPANY.</p>			<p>c. Wiring and terminations: All wire terminations shall be made with ring torque compression type connectors which firmly grip the conductors and preferably insulated compressions sleeves to grip the wire insulation. Soldering of connections in electronic circuits shall be of the highest quality. While soldering adequate care shall be taken that electronic components are not damaged. Wiring between terminals of various devices shall be point to point (no wire splicing or ‘T’ connections) with wire trunked. It shall be so arranged that instruments or devices may be removed and / or serviced without unduly disturbing the wiring. Each wire shall be identified at both ends with wire nos. corresponding to the number shown on the supplier’s drawings. Wire markers used shall be non-deterioration type. Wire shall be run away from all heat generating components. All control wiring shall be adequately segregated and protected from faults on the power circuits. Provisions shall be made for grounding voltage transformer neutrals if required.</p> <p>6.6.10.8 Ground Bus Safety: Refer charger specification section 6.8.6</p> <p>6.6.10.9 Painting Procedure, Equipment Identification: Refer charger specification section 6.8.10</p> <p>6.8 Tropicalization The supplier shall provide details of qualification with regard to tropicalisation of a. Wire b. Terminal blocks c. Circuit Breakers d. Miniature circuit breakers.</p> <p>6.11.1 Supplier’s Drawings Supplier shall forward preliminary drawings of the systems to the purchaser within 8 weeks from the time requisition is issued. These drawings shall include general arrangement, bill of materials, weights, outline dimensions, schematic and wiring diagrams. Following drawings for approval and /or information shall be submitted to the purchaser:</p> <ol style="list-style-type: none"> 1. General arrangement drawing showing the locations of all equipment and dimensions of panels 2. Bill of material for approval 3. Foundation drawings of panels for approval. 4. Schematic drawings for approval 5. Spares list for approval 6. Name plate details for approval 7. Wiring diagrams for information and records. <p>Whereas following documents have to be sent to purchaser at appropriate stage of system execution.</p> <ol style="list-style-type: none"> 1. Test procedure for approval 2. Test reports – 5 copies 3. Instruction manuals – 10 copies 4. Quality Assurance Plan (QAP) for approval <p>Five copies of history docket both hard copy and softcopy shall be furnished. History docket shall be made as per PRD-PROC-19. A sample history docket shall be submitted to the purchaser for clearance. Once purchaser clears the sample, 5 copies of history dockets shall be submitted both in hardcopy and softcopy form. Supplier, before commencing with fabrications shall prepare and submit to the purchaser for approval four complete sets of shop drawings which shall show the fabrication details. These drawings when approved in writing by the purchaser shall form part of this specification. After said drawings have been approved, the supplier shall furnish five additional complete sets of all final drawings, including all subsequent revisions approved by the purchaser in both hard & soft form.</p> <p>6.11.2 Test Procedure Supplier shall submit test procedure for purchaser’s approval well in advance before starting testing. Equipment shall be tested as per approved test procedure.</p>	



A4-11

CE/416/NPCIL/220VDC/TR

REV 00

PAGE 07 OF 08

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6.11.3 Sub-Contractors: Normally supplier shall not sub-contract any or all of the work involved in execution of the system. In exceptional cases, supplier shall take written permission from the Purchaser for sub-contracting. Supplier shall be responsible to the purchaser for all work of any sub-contractor allowed by the purchaser.

7.0 INSPECTION & REPORTS : Refer charger specification section 7.0

8.0 TESTS

The manufacturer shall carryout tests to show that the equipment has been satisfactorily designed and manufactured and performs to the standards required by this specification. If some tests mentioned cannot be carried out at supplier's works, the same shall be carried out at site. In such a case, the supplier shall indicate the procedure of the test. If the equipment does not pass the test, it shall be the supplier's responsibility at his cost. Any special equipment required for testing, like meters or relays, etc. if not available at purchaser's site office shall be supplied by the supplier.

8.1 Component Testing All components/equipment/sub-assemblies to be used in Main Control Centre Power Supply Distribution (MCCPSD) panels shall be subjected to visual, mechanical, electrical and functional tests. The test results shall be documented and submitted to customer QA engineer for review. Details of the tests to be conducted shall be listed in Quality Assurance Plan to be submitted by the supplier based on enclosed sample QAP after award of contract. The components to be tested are shown below. Supplier shall test all the components/equipment/sub-assemblies used and not necessarily only the components listed below.

List of Components to be tested

1. Indicating lamps
2. Circuit breakers
3. Hand switches
4. Fuses
5. Volt meters
6. Ammeters
7. Cables
8. PTFE wires
9. Miniature circuit breakers
10. Flasher circuit
- 10.1 Resistors
- 10.2 Capacitors
- 10.3Relays 10.4PCB 10.5Semiconductor components & ICs
11. Insulation Monitoring Device(IMD)
12. Scanner
13. Earth Fault Sensor(EFS)
14. MCB Status Central Processing and Display(MSCPD)
15. Local Control Module(LCM)
16. MCB Status Remote Display(MSRD)

8.2 Tests on complete system The following tests shall be conducted on the complete Main Control Centre Power Supply distribution (MCCPSD) panels:



A4-11

CE/416/NPCIL/220VDC/TR

REV 00

PAGE 08 OF 08

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8.2.1 Routine Tests

1. Connection checking & overall dimension checking.
2. Insulation resistance test on complete panel.
3. High Voltage test on complete panel.
4. Indications & alarm function.
5. Operation of no voltage test.
6. Ground fault detection system as per specification no. PC-E-249.
7. MCB status monitoring system as per specification no. PC-E-248.
8. Flasher Unit as per NPCIL approved test procedure

8.2.2 Acceptance Test

- 8.2.2.1 Connection checking and overall dimension checking.
- 8.2.2.2 Insulation test on complete panel.
- 8.2.2.3 High voltage test on complete panel.
- 8.2.2.4 Indication & alarm contact function.
- 8.2.2.5 Ground fault detection system as per specification no. PC-E-249
- 8.2.2.6 MCB status monitoring system as per specification no. PC-E-248
- 8.2.2.7 Flasher Unit as per NPCIL approved test procedure.
- 8.2.2.8 Functional test on panels

8.2.3 Special type tests: Environmental Tests- Refer specification of charger section 8.3

8.2.4 Test Certificates 8.2.4.1 All routine and type test certificates including records, performance curves etc. shall be supplied according to the distribution schedule.

8.2.4.2 The Supplier shall ensure that instruments and gauges to be used for testing and inspection have rated calibration and the accuracy can be traced to National / International Standards.

8.2.5 Tests to be carried out at site The following tests shall be conducted at site on MCCPSD panels as per standards specified. These are however not intended to form a comprehensive commissioning check list as it shall be the Supplier's responsibility to draw up and carryout such a programme after obtaining the Purchaser's approval. Following typical checks to be carried out at site:

8.2.5.1 Preliminary Checks

- a. Check name plate details of all associated equipment according to specification.
- b. Check for physical damage.
- c. Check tightness of all bolts, clamps and connecting terminals.
- d. Check cleanliness.
- e. Check earthing.
- f. Check for Lamps, Sockets etc.
- g. Check for general layout.
- h. Check provision of all MCBs, MCCBs, relays, meters, GFD devices, MCB SMS devices etc. as per drawing.

8.2.5.2 Commissioning Checks

- a. Each wire shall be traced by continuity tests and it should be made sure that the wiring is as per relevant drawings. All interconnection between panels / equipment shall be similarly checked.
- b. All the wired terminals shall be meggered to earth. c. Megger test between bus bars and bus bars to earth. d. Settings of relays, MCBs, other alarms tripping devices and interlocks as per scheme. e. Functional checking of all control circuits including metering and relay circuits. f. Insulation resistance test of all circuits. g. Functioning of GFD and MCB SMS.

9.0 PACKING AND SHIPMENT: Refer charger specification section 9.0



A4-10

CE/416/NPCIL/220VDC

REV 00

PAGE 01 OF 01

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ANNEXURE-A

TECHNICAL COMPLIANCE SHEET FOR CHARGER TO BE FILLED BY PARTICIPATING VENDORS AND SUBMITTED ALONG WITH TECHNICAL BID

REVISION: 00

APPROVED

RAJASEKAR K

PREPARED

AMIT KR SHARMA

ISSUED

416

DATE

29 / 8 / 15

ANNEXURE – A

TECHNICAL PARTICULARS REQUIRED WITH THE BID

1.0 TECHNICAL DATA TO BE SUPPLIED ALONGWITH THE TENDER

Bidders shall submit with their bids a complete description of all equipment on which their bid is based and such description shall include the details given hereunder. It is necessary that all details shall be completely filled in the first instance to evaluate the bid and compare it with other offers.

Bids with incomplete or ambiguous information shall not be considered.

The details hereunder shall be completed in all respects and reference to other places shall be avoided as far as possible.

All ratings indicated by the bidder shall be at specified ambient conditions.

1.1 Complete Equipment

1.1.1	Manufacturer's Name	-----	-----
1.1.2	Type reference	-----	-----
1.1.3	Nominal Ratings	-----	-----
1.1.3.1	Input voltage	-----	-----
1.1.3.2	Output voltage	-----	-----
1.1.3.3	Output current	-----	-----
1.1.4	Output DC Voltage Range	-----	-----
1.1.5	Output voltage regulation at 2.2V DC float & boost voltage at 2.4V DC per cell respectively.	-----	-----

1.1.5.1	Steady state	-----
1.1.5.2	Transient state variation for sudden application and removal of 100% load.	-----
1.1.6	Recovery time of voltage from transient condition to rated voltage	-----
1.1.7	Ripple content in DC output for full load at nominal input/output voltage with battery disconnected.	-----
1.1.8	Efficiency at full load and nominal input/output voltage	-----
1.1.9	Boost charging current limit adjustable range	Yes/No
1.1.10	Equalize charging current limit adjustable range	Yes/No
1.1.11	Is diode voltage regulator as Per section no. 6.2.1 provided?	-----
1.1.12	Harmonics injected into mains because of DCPS	-----
1.1.13	Power factor at the input of charger.	-----
1.1.14	Is cable entry from top?	-----
1.1.15	Weight of complete DCPS	-----
1.1.16	Overall size of DCPS	-----
	Width x depth x height (in mm)	-----

- 1.1.17 Ambient temperature and humidity at which DCPS can operate satisfactorily. -----
- 1.1.18 Method of cooling Natural or Forced :
- 1.1.19 a) Whether details of painting procedure and painting tests are enclosed? Yes/No
- 1.1.20 b) Colour of finish paint
- Outside -----
- Inside -----
- 1.1.21 Noise level of DCPS -----
- 1.1.22 Short time current withstand rating at D.C. output. -----
- 1.1.23 Standard power frequency insulation withstand for one minute. -----
- 1.1.24a) Mean time between failure of Complete equipment. -----
- b) Device having lowest MTBF. -----
- 1.1.25 Earth Bar
- Is it made of copper and 150 Sq. mm? Yes/No
- 1.1.26 Can the electronic components be subjected to burn in test before use? Yes/No

1.1.27 Is the equipment fully Tropicalized? Yes/No

1.1.28 Do all equipment used Independently support Combustion. -----

1.1.29 Is mimic diagram provided? -----

1.1.30 Over load capacity. -----

1.2 Housing

1.2.1 Thickness of sheet steel. -----MM

1.2.2 Is sheet steel cold rolled ? Yes/No

1.2.3 Are ventilation louvers provided? Yes/No

1.2.4 Are ventilation louvers screened? Yes/No

1.2.5 Is the enclosure rigid, free floor standing? Yes/No

1.2.6 Are non magnetic flanges for input AC cable entry provided? Yes/No

1.2.7 IP Number of the housing as per IS:60947. -----

1.3 List of recommended spares for five years operation.

1.4 Tests

- 1.4.1** Tests mentioned in section 8.0 will be Performed including EMC testing. Yes/No
- 1.4.2.1** By testing only? Yes/No
- 1.4.2.2** Where will seismic testing be conducted? -----
- 1.4.3** Whether DCPS qualified as per IEEE-650 Yes/No
- 1.4.4** Which tests are proposed to be done at site? (List the number given in Specification)
- 1.5** List of deviations enclosed. Yes/No
- 1.6** Schematic diagram of DCPS enclosed. Yes/No
- 1.7** Delivery schedule
- Schedule in weeks after placement of orders:
- 1.7.1** Submission of drawings, QA plan, test : procedures
- 1.7.2** Time allowed for approval by purchaser:
- 1.7.3** Complete fabrication of first 220V DCPS :
- 1.7.4** Schedule for completion of routine tests:
- 1.7.5** Schedule for completion of special type: tests

1.7.6 Production schedule of balance 220V DCPS:

1.7.7 Schedule for inspection, testing and delivery at site of all equipment for first unit. :

1.7.8 Schedule for manufacture, inspection, testing and delivery at site of all equipment for second unit. :

1.7.9 Time required for erection of all equipment and keeping ready for commissioning :

1.7.10 Time required for conducting site test :

2.0 TENDER DRAWINGS

The Bidder shall list the tender drawings which are being submitted along with the bid. A general arrangement drawing showing main equipment layout, general features, overall dimensions, wiring arrangement etc, must accompany the bid.

3.0 TIME REQUIRED BY SUPPLIER

The supplier must state the period required for the preparation of drawings and the time he has allowed for approval of the drawings by the purchaser in the delivery period specified.

4.0 TRANSPORTATION

The supplier must state the mode of transportation whether by rail or by truck, and what measures will be taken to ensure that the equipment will not be damaged in transit.

5.0 PROOF OF ABILITY

The bidder shall submit a brief list of work executed by him to standards and requirements specified in the tender document.

6.0 DEVIATIONS FROM SPECIFICATIONS

Any deviations in test procedure from this specification.

Any deviation in items offered.



A4-10

CE/416/NPCIL/220VDC

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PAGE 01 OF 01

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ANNEXURE-B

QAP FOR CHARGER

(The QAP is subject to approval)

REVISION: 00

APPROVED

RAJASEKAR K

PREPARED

AMIT KR SHARMA

ISSUED

416

DATE

29 / 8 / 15

QUALITY ASSURANCE PLAN FOR 220V DC MAIN BATTERY CHARGERS (SAMPLE)

Sl. No	Components and Operations	Characteristics	Class	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORDS	AGENCY			REMARKS		
									P	W	V			
1.	Component Screening	Visual Burn-in Test Electrical Test Functional Test	C C C C	Verification	Sample	NPCIL spec. PC-E-251	NPCIL spec. PC-E-251	TC	2	2	1			
				Operational Measurement	Sample								2	1
				Performance	Sample								2	1
				Measurement	Sample								2	1
2.	Power Transformer	Dimensions Voltage ratio Impedance voltage and load loss No load current & loss Insulation resistance Dielectric strength Temp. rise Double freq. Double voltage withstand test	B B C C C C C C	Measurement	100%	IS-11171	IS-11171 Class of insulation as per NPCIL spec.	TR	2	2,1	1	CHP		
				Measurement	100%								2	1
				Measurement	100%								2	1
				Measurement	100%								2	1
				Measurement	100%								2	1
				Measurement	100%								2	1
				Measurement	Sample								2	1
				Measurement	Sample								2	1
3.	Series Reactor	Dimension Inductance value Insulation resistance Dielectric strength Temp. rise Double freq. Double voltage withstand test	B B C C C C	Measurement	Sample	IS-5553	IS-5553	TR	2	2	1			
				Measurement	Sample								2	1
				Measurement	Sample								2	1
				Performance	Sample								2	1
				Measurement	Sample								2	1
				Performance	Sample								2	1
				Measurement	Sample								2	1
				Measurement	Sample								2	1
4.	Control Transformer / Pulse Transformer	Dimension Terminal Marking & Polarity Voltage ratio No load current Insulation resistance Dielectric strength	B B C C C C	Measurement	Sample	IS-3156	IS-3156	TC	2	2	1			
				Verification	Sample								2	1
				Measurement	Sample								2	1
				Measurement	Sample								2	1
				Measurement	Sample								2	1
				Measurement	Sample								2	1
				Measurement	Sample								2	1
				Performance	Sample								2	1

QUALITY ASSURANCE PLAN FOR 220V DC MAIN BATTERY CHARGERS (SAMPLE)

Sl. No	Components and Operations	Characteristics	Class	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORDS	AGENCY			REMARKS		
									P	W	V			
5.	Contactors	Visual Dimensions Operation (pick up / dropout) Type no./Marking Insulation resistance Dielectric strength	A	Verification	Sample	IS-60947 Manufacturer's catalogue	IS-60947	TC	2	2	1			
			B	Measurement	Sample					2	2	1		
			C	Performance	Sample						2	2	1	
			C	Verification	Sample						2	2	1	
6.	Moulded Case Circuit Breaker/ MCB	Visual Dimension Operation Type no./Marking Tripping characteristics Insulation resistance Dielectric strength	A	Verification	Sample	Manufacturer's Spec. IS-2516 IS-60898	IS-2516 IS-60898	TC	2	2	1			
			B	Measurement	Sample					2	2	1		
			C	Performance	Sample						2	2	1	
			C	Verification	Sample						2	2	1	
7.	Fuses	Dimension Type no./Marking Continuity	A	Measurement	Sample	Manufacturer's Spec.	IS-13703	TC	2	2	1			
			C	Verification	Sample					2	2	1		
			C	Verification	Sample						2	2	1	
			C	Verification	Sample						2	2	1	
8.	Fuse holders	Visual Dimension Type no./marking Insulation resistance Dielectric strength	A	Verification	Sample	Manufacturer's Spec.	Manufacturer's spec.	TC	2	2	1			
			A	Measurement	Sample					2	2	1		
			C	Verification	Sample						2	2	1	
			C	Measurement	Sample						2	2	1	
9.	Switches (select or/push button)	Visual Dimension Operation Type no./marking Insulation resistance Dielectric strength	B	Measurement	Sample	Manufacturer's Spec. IS-6975 IS-4794	IS-6975 IS-4794	TC	2	2	1			
			C	Verification	Sample					2	2	1		
			C	Performance	Sample						2	2	1	
			C	Verification	Sample						2	2	1	
			C	Measurement	Sample					2	2	1		
			C	Performance	Sample						2	2	1	
			C	Measurement	Sample						2	2	1	
			C	Performance	Sample						2	2	1	

QUALITY ASSURANCE PLAN FOR 220V DC MAIN BATTERY CHARGERS (SAMPLE)

Sl. No	Components and Operations	Characteristics	Class	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORDS	AGENCY			REMARKS	
									P	W	V		
10.	Printed Circuit Board	Dimension	B	Measurement	100%	PP-E-1443	PP-E-1443	TC	2	2	1		
		Continuity	C	Verification	100%					2	2	1	
		Solderability	C	Verification	Sample						2	2	
		Insulation resistance	C	Measurement	Sample						2	2	
		Dielectric strength	C	Performance	Sample						2	2	
11.	Meters	Peel strength	C	Measurement	Sample					2	2		
		Visual	A	Verification	Sample	Manufacturer's Spec.	IS-1248 / IS-8573	TC	2	2	1		
		Dimension	B	Measurement	Sample					2	2		
		Type no./marking	C	Verification	Sample					2	2		
		Accuracy	C	Measurement	Sample					2	2		
12.	Current Transformer	Insulation resistance	C	Measurement	Sample					2	2		
		Dimension	B	Measurement	Sample	Manufacturer's Spec.	IS-2705	TC	2	2	1		
		Terminal	B	Verification	Sample					2	2		
		Marking & polarity	B	Verification	Sample					2	2		
		Turns ratio	C	Measurement	Sample					2	2		
13.	Relays	Insulation resistance	C	Measurement	Sample					2	2		
		Dielectric strength	C	Performance	Sample					2	2		
		Dimension	B	Measurement	Sample	Manufacturer's Catalogue	IS-5051	TC	2	2	1		
		Coil	B	Measurement	Sample					2	2		
		Resistance	B	Measurement	Sample					2	2		
14.	Transistors	Operating voltages	C	Measurement	Sample					2	2		
		Insulation resistance	C	Measurement	Sample					2	2		
		Dielectric strength	C	Performance	Sample					2	2		
		Solderability	C	Performance	Sample					2	2		
		Dimension	B	Measurement	Sample	Manufacturer's spec.	IS-14901	TC	2	2	1		
		Type No./Marking	B	Verification	Sample					2	2		
		Solderability	C	Verification	Sample					2	2		
		Breakdown voltage	C	Measurement	Sample					2	2		
		V _{ceo}	C	Measurement	Sample					2	2		
		Amplification factor	C	Measurement	Sample					2	2		
		Collector leakage current	C	Measurement	Sample					2	2		
		Resistance to solvent	C	Verification	Sample					2	2		

QUALITY ASSURANCE PLAN FOR 220V DC MAIN BATTERY CHARGERS (SAMPLE)

Sl. No	Components and Operations	Characteristics	Class	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORDS	AGENCY			REMARKS
									P	W	V	
15.	Voltage reference diodes	Dimension Type no./marking Break down voltage Leakage current Burn-in Test for 48 hrs. Resistance to solvent	B	Measurement	Sample	Manufacturer's Spec.	IS-14901	TC	2	2	1	
			C	Verification	100%	IS-14901	Part-3	↓	↓	↓		
			C	Measurement	100%	Part-3	↓	↓	↓			
			C	Performance	100%	Sample	↓	↓	↓			
16.	Signal diodes	Dimension Type No./marking Reverse leakage current Solderability	B	Measurement	Sample	Manufacturer's spec.	IS-14901	TC	2	2	1	
			C	Verification	100%	spec.	↓	↓	↓			
			C	Measurement	100%	IS-14901	↓	↓	↓			
17.	Power Diodes	Visual Dimension Type No./marking Reverse leakage current	A	Verification	100%	Manufacturer's Catalogue	IS-3895	TC	2	2	1	
			B	Measurement	Sample	IS-3895	↓	↓	↓			
			C	Verification	100%	IS-3895	↓	↓	↓			
18.	Low Power resistors	Visual Resistance value Solderability	A	Verification	Sample	IS-5786	IS-5786	TC	2	2	1	
			C	Measurement	100%	Part I-XI	Part I-XI	↓	↓	↓		
			C	Verification	Sample	IS-5786	↓	↓	↓			
19.	Power resistors	Visual Type no./Marking Dimension Resistance value Insulation resistance Dielectric strength	A	Verification	100%	IS-5786	IS-5786	TC	2	2	1	
			B	Verification	100%	IS-8872	IS-8872	↓	↓	↓		
			C	Measurement	Sample	IS-8872	↓	↓	↓			
			C	Measurement	100%	Sample	↓	↓	↓			
C	Performance	Sample	Sample	↓	↓	↓						

QUALITY ASSURANCE PLAN FOR 220V DC MAIN BATTERY CHARGERS (SAMPLE)

Sl. No	Components and Operations	Characteristics	Class	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORDS	AGENCY			REMARKS
									P	W	V	
20.	ICs a) Linear	Visual Type No./marking Functional	B	Measurement	Sample	Manufacturer's Spec. IS-14901 Part-3	IS-14901 Part-3	TC	2	2	1	
			B	Verification	Sample				2	2	1	
			C	Performance	Sample				2	2	1	
	b) Digital	Visual Type No./marking Functional	A	Verification	Sample	Manufacturer's Spec. IS-4317	IS-4317	TC	2	2	1	
			B	Verification	Sample				2	2	1	
			C	Performance	Sample				2	2	1	
21.	Electrolyte capacitors a) for PCBs	Visual Type No./marking Dimension Capacitance value Leakage current	A	Verification	100%	Manufacturer's Spec. IS-4317	IS-4317	TC	2	2	1	
			B	Verification	100%				2	2	1	
			C	Measurement	Sample				2	2	1	
	b) DC Filter	Visual Type No./Marking Leakage current Insulation resistance Dielectric strength	A	Verification	100%	Manufacturer's Spec. IS-4317	IS-4317	TC	2	2	1	
			B	Verification	100%				2	2	1	
			C	Measurement	Sample				2	2	1	
C	Measurement	Sample	2	2	1							

QUALITY ASSURANCE PLAN FOR 220V DC MAIN BATTERY CHARGERS (SAMPLE)

Sl. No	Components and Operations	Characteristics	Class	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORDS	AGENCY			REMARKS
									P	W	V	
22.	Ceramic disc capacitor/ metallised polyester capacitor/ tantalum capacitors	Visual Type No./marking Dimension Capacitance value	A	Verification	100%	Manufacturer's Spec. JSS-50203/ JSS-50204 JSS-50205	JSS-50206/ JSS-50204 JSS-50205	TC ↓	2	2	1	
			B	Verification	100%				↓	↓	↓	
			C	Measurement	100%				↓	↓	↓	
23.	Lamination	Dimension Stacking factor Surface insulation	C	Measurement	Sample	IS-11794	IS-11794	TC ↓	2	2	1	
			B	Verification	100%				↓	↓	↓	
			C	Verification	Sample				↓	↓	↓	
24.	PVC insulated copper wire	Visual Dimension Insulation resistance Dielectric strength	A	Verification	100%	IS-694	IS-694	TC ↓	2	2	1	
			C	Measurement	100%				↓	↓	↓	
			C	Measurement	100%				↓	↓	↓	
25.	Thyristors / Power Transistors	Visual Type No./Marking Triggering leakage	A	Measurement	Sample	Manufacturer's spec. IS-7788 IEC-146	IS-7788 IEC-146	TC ↓	2	2	1	
			B	Verification	100%				↓	↓	↓	
			C	Performance Measurement	100%				↓	↓	↓	
26.	Electrical (wiring)	Routing of wires Bunching, Ferruling, Crimping, soldering, Clearance and colour coding	B	Visual	100%	Manufacturer's spec.	Manufacturer's spec.	TC ↓	2	2	1	
			B	Visual	100%				↓	↓	↓	

QUALITY ASSURANCE PLAN FOR 220V DC MAIN BATTERY CHARGERS (SAMPLE)

Sl. No	Components and Operations	Characteristics	Class	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORDS	AGENCY			REMARKS
									P	W	V	
27.	Painting	Pretreatment check	C	Process	Clause no. 3.0 of IS-101	PC-E-251	PC-E-251	TR	2	2,1	1	CHP To be conducted on test coupon
		Scratch hardness check	B	Physical	Clause no. 2.0 of IS-101	IS-101	IS-101	→	→	→	→	
		Bend (flexibility) Test	B	Mechanical	Clause no. 5.0 of IS-101	IS-101	IS-101	→	→	→	→	
		Pull of Adhesion test	B	Physical	Clause no. 5.0 of IS-101	IS-101	IS-101	→	→	→	→	
28.	Sub Assembly	Painting thickness check	B	Measurement		PC-E-251	PC-E-251	TC	2	2	1	
		Dimension	B	Measurement	Sample	Manufacturer's drawings	Manufacturer's drawings	→	→	→	→	
		Component verification	B	Comparison	Sample	Manufacturer's drawings	Manufacturer's drawings	→	→	→	→	
		Layout verification	B	Comparison	Sample	Manufacturer's drawings	Manufacturer's drawings	→	→	→	→	
		Wiring check	C	Continuity	Sample	Manufacturer's drawings	Manufacturer's drawings	→	→	→	→	
		Insulation resistance	C	Measurement	Sample	Manufacturer's drawings	Manufacturer's drawings	→	→	→	→	
		Dielectric strength	C	Performance	Sample	Manufacturer's drawings	Manufacturer's drawings	→	→	→	→	
29.	Final Assembly and pre testing	Dimension	B	Measurement	100%	Manufacturer's drawings	Manufacturer's drawings	TC	2	2	1	
		Component verification	B	Comparison	100%	Manufacturer's drawings	Manufacturer's drawings	→	→	→	→	
		Layout verification	B	Comparison	100%	Manufacturer's drawings	Manufacturer's drawings	→	→	→	→	
		Wiring check	C	Continuity	100%	Manufacturer's drawings	Manufacturer's drawings	→	→	→	→	
		Cable identification	B	Comparison	100%	Manufacturer's drawings	Manufacturer's drawings	→	→	→	→	
30.	Final testing (a) Physical Verification	Insulation resistance	C	Measurement	100%	Manufacturer's drawings	Manufacturer's drawings	→	→	→	→	
		Dielectric strength	C	Performance	100%	Manufacturer's drawings	Manufacturer's drawings	→	→	→	→	
		Presence of all items as per Bill Of Material (BOM)	B	Visual	100%	Manufacturer's drawings	Manufacturer's drawings	→	→	→	→	

QUALITY ASSURANCE PLAN FOR 220V DC MAIN BATTERY CHARGERS (SAMPLE)

Sl. No	Components and Operations	Characteristics	Class	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORDS	AGENCY			REMARKS
									P	W	V	
31.	Performance test	Dimension Connection checking High voltage test Alarm and indication Efficiency test Voltage regulation of rectifier Ripple content of rectifier Undershoot and overshoot of rectifier output Input inrush current measurement test Dry heat test for PCBs Damp heat test for PCBs Short circuit capability Temperature rise test Diode Voltage Regulator operation test	C B B B C C C B C C C C C C	Measurement Performance Performance Performance Measurement Measurement Measurement Measurement Measurement Measurement Performance Performance Performance Performance Performance	100% 100% 100% 100% 100% 100% 100% 100% 100% One no. each type 100% One DCPS 100%	As per approved test procedure	As per approved test procedure	TR	2	2,1	1	CHP

QUALITY ASSURANCE PLAN FOR 220V DC MAIN BATTERY CHARGERS (SAMPLE)

Sl. No	Components and Operations	Characteristics	Class	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORDS	AGENCY			REMARKS
									P	W	V	
		Burn-in test	C	Performance	100%	As per approved test procedure	As per approved test procedure	TR	2	2,1	1	CHP
		Qualification as per IEEE-650	C	Performance	One DCPS	As per approved test procedure			3			
		EMC test	C	Performance	One DCPS				3			
		Battery charging test at boost voltage	C	Performance	100%				2			
		Battery charging test at equalize voltage	C	Performance	100%							
		Insulation resistance value	B	Performance	100%	As per design document	More than 5 megohm.					
	Insulation test											
	(a) between I/P and Earth											
	(b) between O/P and Earth											
	(c) Between I/P and O/P											

LEGEND:

P	: Performed by	A	: Minor	1.	: Purchaser
W	: Witnessed by	B	: Major	2.	: Prime Supplier
V	: Verified by	C	: Critical	3.	: External Laboratory
		TC	: Test Certificate		
		TR	: Test Report		
		CHP	: Customer Hold Point		



A4-10

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ANNEXURE-C

LIST OF ALARMS AND INDICATORS

REVISION: 00

APPROVED

RAJASEKAR K

PREPARED

AMIT KR SHARMA

ISSUED

416

DATE

29 / 8
/15

DETAILS OF ALARM AND INDICATIONS

Sl. No.	Alarm description	Potential Free Contact required	LED indication required	Input CB status	Output CB status	Main DCPS contactor status	Standby DCPS contactor status	Applicability	Remarks
1	220V DC Load on standby DCPS	YES	YES	ON	ON	ON	ON	DCPS-1,2,3,5,6	Alarm & trip
2	220V DC Low Battery for DCPS	YES	YES	ON	ON	OFF	OFF	ALL DCPS	Alarm
3	220V DCPS voltage trouble	YES	YES	ON (OFF during DC overvoltage trip)	ON	OFF	ON	ALL DCPS	Alarm & trip
4	220V DCPS Battery CB open	YES	YES	ON	ON	ON	OFF	DCPS-1,2,3,5,6	Alarm
5	220V DCPS input voltage high	YES	YES	ON	ON	ON	OFF	ALL DCPS	Alarm
6	220V DCPS input current high	YES	YES	ON	ON	ON	OFF	ALL DCPS	Alarm
7	Mains failure	YES	YES	ON	ON	OFF	ON	ALL DCPS	Alarm & trip

Sl. No.	Alarm description	Potential Free Contact required	LED indication required	Input CB status	Output CB status	Main DCPS contactor status	Standby DCPS contactor status	Applicability	Remarks
8	Control power supply failure	YES	YES	ON	ON	OFF	ON	ALL DCPS	Alarm & trip
9	220V DCPS Output voltage Low	YES	YES	ON	ON	OFF	ON	ALL DCPS	Alarm & trip
10	220V DCPS output overload	YES	YES	ON	ON	ON	OFF	ALL DCPS	Alarm & trip
11	Battery charging current high	YES	YES	ON	ON	ON	OFF	ALL DCPS	Alarm
12	Equipment over temperature	YES	YES	ON	ON	ON	OFF	ALL DCPS	Alarm
13	Battery on load	YES	YES	ON	ON	OFF	OFF	DCPS-1,2,3,5,6	Alarm
14	Standby not available	YES	YES	ON	ON	ON	OFF	DCPS-1,2,3,5,6	Alarm
15	Rectifier Fuse failure	YES	YES	ON	ON	ON	OFF	ALL DCPS	Alarm
16	Capacitor fuse failure	YES	YES	ON	ON	ON	OFF	ALL DCPS	Alarm
17	Fan failure	YES	YES	ON	ON	ON	OFF	ALL DCPS	Alarm
18	Output CB tripped	YES	YES	ON	OFF	OFF	ON	ALL DCPS	Alarm & trip
19	DC over voltage	YES	YES	OFF	ON	OFF	ON	ALL DCPS	Alarm & trip



A4-10

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ANNEXURE-D

BLOCK DIAGRAM OF CHARGER

REVISION: 00

APPROVED

RAJASEKAR K

PREPARED

AMIT KR SHARMA

ISSUED

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DATE

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PAGE 01 OF 01

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ANNEXURE-E

FEEDER LOAD LIST AND BATTERY SIZING

REVISION: 00

APPROVED

RAJASEKAR K

PREPARED

AMIT KR SHARMA

ISSUED

416

DATE

29 / 8 / 15

PROJECT: KAPP 3 & 4 (TG & BOP C&I)

220V DC CHARGER/Load List

Feeder no	Feeder Description	Identification Code	Feeder Load in Amps	MCB rating in Amps	Fuse rating in Amps	Suitable Cable
1	64111-PL-01	64000-PL-41	20	25	32	2C X 35
2	64111-PL-02	64000-PL-42	20	25	32	
3	64111-PL-05	64000-PL-43	20	25	32	2C X 35
4	TSC		10			
Total Load including spare margin			70			
Total load including 15% design margin			81			
10% of battery Ah			18			
Charger rating (A)			88			

SUMMARY OF NUMBER OF FEEDERS (MCB/FUSE)

S.No	Rating	Qty. USED	SPARE	TOTAL
1	25A/32A	3	1	4
	TOTAL	3	1	4

Note: The above feeders mentioned for the DCDB-1 of charger-1 of unit-3. DCDB-2 of charger-2 for unit-3 is identical.

BATTERY SIZING:

MAKE OF BATTERY	HBL	BUI	EXIDE
RATED LOAD	70		
Permissible Voltage variation at Panels in volts (A)	176 - 242 V		
Allowed Voltage drop from Battery to DCDB to DCS panels : (B)	16		
Minimum voltage at Battery bank after discharge for 1 hour C=(A+B)	192		
End cell voltage 'ECV' after discharge for 1 hour in Volts per cell (D)	1.75	1.75	1.75
Number of cells required F= (C /D)	110	110	110
Number of cells considered (each with nominal voltage of 2V)	110	110	110
K-factor	1.66	1.67	1.67
Ageing factor	1.25	1.25	1.25
Design margin	1	1	1
Temperature correction factor	1.0989	1.0989	1.207
Considering K-factor, Ageing factor, Design margin & TCF Required AH = RATED LOAD x G x H x I x J	160	161	176

CABLE SIZE CALCULATION		
Voltage drop from Battery to Charger		
1	Number of cells (A)	110
2	Float Voltage per cell (B)	2
3	Float mode Voltage at Battery Charger (C) = A x B	220
4	Distance from Battery to Charger in mtrs (D)	165
5	Load Current (Amps) (E)	70
6	Size of Cable from Battery to Charger (Sqmm bare COPPER)	70
7	Resistance of cable at 20 deg.C in Ohms/Km (F)	0.27
8	Resistance of cable at 40 deg.C in Ohms/Km (G) = F/0.926	0.2916
9	Voltage drop in Cable per run (Volts) (H)=(ExGx2D)/1000	6.735
10	Number of runs of cable per pole (I)	1
11	Voltage Drop for "I" runs of cable (Volts) (J) = H/I	6.735
Voltage drop from DCDB to DCS Panels		
1	Distance from DCDB to Panels (mtrs) (K)	20
2	Panel Load Current range (Amps)	0 - 20
3	Max Load current considered (Amps) (L)	20
4	Size of Cable from DCDB to Panels (Sqmm bare COPPER)	70
5	Resistance of cable at 20 deg.C (Ohms/Km) (M)	0.27
6	Resistance of cable at 45 deg.C (Ohms/Km) (N) = M / 0.909	0.297
7	Voltage drop in Cable (Volts) (O) =(2KxLxN)/1000	0.238
10	Number of runs per pole (P)	1
11	Voltage Drop for "I" runs of cable (Volts) (Q) = O/P	0.238
Total Voltage drop (Battery to Charger to DCDB to Panels) = J+Q		6.973
Voltage available at panel on Full Load in Float Mode = C - Q		219.762
<p>Note:-</p> <ol style="list-style-type: none"> The cable conductor resistance are taken as per IS:8130-1984, Table 2 for stranded Al conductor, Class 2, Annex-A. 1C 630Sqmm cable envisaged between battery to charger. One runs will be used as +ve cable and one as -ve. 2C 35 Sqmm cable envisaged between charger to panels. One core will be used as +ve cable and another as -ve Temperature correction factor of 1.0989 is considered as per IS-1651 for lead acid tubular batteries <p>* M/s BUI is acquired by M/s Union Batteries</p>		



A4-10

CE/416/NPCIL/220VDC

REV 00

PAGE 01 OF 01

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ANNEXURE-F

TECHNICAL COMPLIANCE SHEET FOR DCDB TO BE FILLED BY PARTICIPATING VENDORS AND SUBMITTED ALONG WITH TECHNICAL BID

REVISION: 00

APPROVED

RAJASEKAR K

PREPARED

AMIT KR SHARMA

ISSUED

416

DATE

29 / 8 / 15

ANNEXURE – F

TECHNICAL PARTICULARS REQUIRE

1.0 TECHNICAL DATA TO BE SUPPLIED ALONGWITH THE TENDER

Tenderers shall submit with their bids, a complete description of all equipment on which their bid is based and such description shall include the details given hereunder. It is necessary that all details shall be completely filled in the first instance to evaluate the bid and compare it with other offers.

Bids with incomplete or ambiguous information shall not be considered.

The details hereunder shall be complete in all respects and reference to other places shall be avoided as far as possible.

Class I
220V DC

- 2.1 Complete Equipment
 - 2.1.1 Make
 - 2.1.2 Type reference
 - 2.1.3 Is indication provided?
 - 2.1.4 Is voltmeter provided?
 - 2.1.5 Is ammeter provided?
 - 2.1.6 Are fuse ratings as per specifications?
 - 2.1.7 Are no. of sub-buses as per specifications?
 - 2.1.8 Are no. of MCBs as per specification?
 - 2.1.9 Are ratings of CBs as per specs?

Class I
220V DC

- 2.1.10** Is cable entry from bottom/top?
- 2.1.11** Ambient temperature and humidity at which the system can operate satisfactorily.
- Temperature
- Humidity
- 2.1.12** Are the panels seismically Qualified?
- 2.1.13** Whether panels are seismically qualified by analysis and testing or by testing
- 2.1.14** Mean time between failure of
- Complete equipmentHrs
 - Device having lowest MTBFHrs
 - MTTRHrs
- 2.1.15** Are the electronic components subjected to burn-in-test before use? Yes/No.
- 2.1.16** Is the equipment fully tropicalised? Yes/No.
- 2.1.17** Is the empty panel electromagnetic shielded and Flasher unit EMC tested? Yes/No.
- 2.1.18** Do all equipment used independently support combustion? Yes/No.

Class I
220V DC

2.1.19	Are the panels natural cooled?	Yes/No.	
2.1.20	Temperature rise anticipated inside panel	--- ⁰ C.	
2.1.21	Is the color shade of the panel shade 365 as per IS-5 for KAPP-3?	Yes/No.	
2.1.22	Is the color shade of the panel shade 275 as per IS-5 for KAPP-4?	Yes/No.	
2.1.23	Weight of each panel		
2.1.24	Overall size of every panel.		
	Heightmm	
	Lengthmm	
	Depthmm	
2.1.25	Insulation resistance of panel at 500V DC.		
2.1.26	Voltage proof of every panel at 1500 V AC.		
2.1.27	Is Insulation Monitoring Device (IMD) mounted?		N
2.1.28	Is scanner and Earth Fault Sensor (EFS) mounted?		N
2.1.29	Is selector HS provided for meter selection?		N

Class I
220V DC

- 2.1.30 Are HS's provided to connect IMD & scanner?
- 2.1.31 Is LCM mounted & wired?
- 2.1.32 Is MSCPD mounted? Not Applicab
- 2.1.33 Are terminations provided for incoming cables?
- 2.1.34 Are bus bars as per specifications?

- 3.0 HOUSING**
- 3.1 Thickness of sheet steel.mmr
- 3.2 Is sheet steel cold rolled? Yes/No
- 3.3 Are ventilation louvers provided? Yes/No
- 3.4 Are ventilation louvers screened? Yes/No
- 3.5 Is the enclosure rigid free floor standing? Yes/No
- 3.6 Is rear access available? Yes/No
- 3.7 Are the panels electromagnetically shielded? Yes/No

- 4.0 TESTS**
- The component tests and other functional tests mentioned in section 8.0 will be performed. Yes/No.

4.1 IR/HV test at appropriate voltage level will be performed at site. Yes/No.

5.0 TENDER DRAWINGS

The Bidder shall list the tender drawings which are being submitted along with the bid. A general arrangement drawing showing main equipment layout, general features, overall dimensions, wiring arrangement etc, must accompany the bid.

6.0 TIME REQUIRED BY SUPPLIER

The supplier must state the period required for the preparation of drawings and the time he has allowed for approval of the drawings by the purchaser in the delivery period specified.

7.0 TRANSPORTATION

The supplier must state the mode of transportation whether by rail or by truck, and what measures will be taken to ensure that the equipment does not get damaged in transit.

8.0 PROOF OF ABILITY

The bidder shall submit a brief list of jobs executed by him (and name of respective customers) to standards and tolerances specified in the tender document. The bidder shall clearly indicate seismically qualified Control power supply distribution system contracts executed, if any.

9.0 LIST OF APPENDICES

A list of all appendices, annexure, characteristic curves, printed technical literatures which form an integral part of this tender shall be listed.

10.0 DEVIATIONS FROM SPECIFICATIONS

The bidder shall note that all the details of the technical specification are not brought out in the section no. 2 against "Technical data to be supplied along with the tender" format. Hence, the bidder shall confirm that the system is as per this complete specification. In case of any deviations, from the technical specification, the deviation shall be clearly listed referring the section of the tender document in order, under the specific heading of deviations from technical specification. Bids which do not list deviations specifically under this heading or do not confirm there are no deviations from the technical specification will not be considered for evaluation.



A4-10

CE/416/NPCIL/220VDC

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PAGE 01 OF 01

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ANNEXURE-G

QAP FOR DCDB

(The QAP is subject to approval)

REVISION: 00

APPROVED

RAJASEKAR K

PREPARED

AMIT KR SHARMA

ISSUED

416

DATE

29 / 8 / 15

QUALITY ASSURANCE PLAN FOR MAIN CONTROL CENTRE POWER SUPPLY DISTRIBUTION PANELS (SAMPLE)

Sl. No	Components and operations	Characteristics	Class	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORDS	AGENCY			REMARKS
									P	W	V	
1.	Miniature Circuit Breaker	Visual Dimension Operation Type no / making Tripping characteristics Insulation resistance Die-electric strength	A B B C C C	Verification Measurement Performance Verification Measurement Measurement Performance	100% Sample 100% 100% Sample 100% Sample	Manufacturer's Spec. IS/IEC-60898	IS/IEC-60898	TC →	2 →	2 →	1 →	
2.	Series reactors	Dimension Inductance Value Insulation resistance Dielectric strength Temp. rise Double Freq. Double Voltage withstand test	B B C C C	Measurement Measurement Measurement Performance Measurement Performance	100% 100% 100% 100% Sample Sample	IS-5553	IS-5553	TR →	2 →	2 →	1 →	
3.	Control Transformer / Pulse Transformer	Dimension Terminal Marking & Polarity Voltage ratio No load current Insulation resistance Dielectric strength	B B C C C C	Measurement Verification Measurement Measurement Measurement Performance	100% 100% 100% 100% 100% 100%	IS-3156	IS-3156	TC →	2 →	2 →	1 →	

ANNEXURE - G

QUALITY ASSURANCE PLAN FOR MAIN CONTROL CENTRE POWER SUPPLY DISTRIBUTION PANELS (SAMPLE)

Sl. No	Components and Operations	Characteristics	Class	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORDS	AGENCY			REMARKS
									P	W	V	
4.	Fuses	Dimension Type no / Marking Continuity	A	Measurement	Sample	Manufacturer's spec.	IS-13703	TC ↓	2	2	1	
			C	Verification	Sample				↓	↓	↓	
			C	Verification	Sample				↓	↓	↓	
5	Fuse holders	Visual Dimension Type no/marking Insulation resistance Dielectric strength	A	Verification	Sample	Manufacturer's spec.	Manufacturer's spec.	TC ↓	2	2	1	
			A	Measurement	Sample				↓	↓	↓	
			C	Verification	Sample				↓	↓	↓	
			C	Measurement Performance	sample				↓	↓	↓	
6.	Printed Circuit Board	Dimension Continuity Solderability Insulation resistance Dielectric strength Peel strength	B	Measurement	Sample	PP-E-1443	PP-E-1443	TC ↓	2	2	1	
			C	Verification	Sample				↓	↓	↓	
			C	Verification	Sample				↓	↓	↓	
			C	Measurement	Sample				↓	↓	↓	
			C	Measurement Performance	Sample				↓	↓	↓	
7.	Relays	Dimension Coil Resistance Operating voltages Insulation resistance Dielectric strength Solderability	B	Measurement	Sample	Manufacturer's Catalogue IS-5051	IS-5051	TC ↓	2	2	1	
			B	Measurement	Sample				↓	↓	↓	
			C	Measurement	Sample				↓	↓	↓	
			C	Measurement Performance	Sample				↓	↓	↓	
			C	Performance	Sample				↓	↓	↓	

ANNEXURE - G

QUALITY ASSURANCE PLAN FOR MAIN CONTROL CENTRE POWER SUPPLY DISTRIBUTION PANELS (SAMPLE)

Sl. No	Components and Operations	Characteristics	Class	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORDS	AGENCY			REMARKS
									P	W	V	
8.	Transistors	Dimension Type No./Marking Solderability Breakdown voltage V _{ceo} Amplification factor Collector leakage current Resistance to solvent	B B C C C C C	Measurement	Sample	Manufacturer's spec. IS-14901	IS-14901	TC	2	2	1	
				Verification	Sample				2	2	1	
				Verification	Sample				2	2	1	
				Measurement	Sample				2	2	1	
9.	Voltage reference diodes	Dimension Type no. / Marking Breakdown voltage Leakage current Resistance to solvent	B B C C C	Measurement	Sample	Manufacturer's spec. IS-14901-3	IS-14901-3	TC	2	2	1	
				Verification	Sample				2	2	1	
				Measurement	Sample				2	2	1	
				Performance	Sample				2	2	1	
10.	Signal diodes	Dimension Type no./Marking Reverse leakage current Solderability	B B C C	Measurement	Sample	Manufacturer's spec. IS-14901-3	IS-14901-3	TC	2	2	1	
				Verification	Sample				2	2	1	
				Measurement	Sample				2	2	1	
				Performance	Sample				2	2	1	

ANNEXURE - G

QUALITY ASSURANCE PLAN FOR MAIN CONTROL CENTRE POWER SUPPLY DISTRIBUTION PANELS (SAMPLE)

Sl. No	Components and Operations	Characteristics	Class	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORDS	AGENCY			REMARKS
									P	W	V	
11.	Low power resistors	Visual Resistance value Solderability	A	Verification	Sample	IS-5786 Part I - XI	IS-5786 Part I - XI	TC ↓	2	2	1	
			C	Measurement	Sample				2	2	1	
			C	Verification	Sample				2	2	1	
12.	ICs a) Linear	Visual Type no./ Marking Functional checks	B	Measurement	Sample	Manufacturer's spec. IS-14901	IS-14901	TC ↓	2	2	1	
			B	Verification	Sample				2	2	1	
			C	Performance	Sample				2	2	1	
	b) Digital	Visual Type no./Marking Functional checks	A	Verification	Sample	Manufacturer's spec. IS-590	IS-590	TC ↓	2	2	1	
			B	Verification	Sample				2	2	1	
			C	Performance	Sample				2	2	1	
13.	Capacitors For PCBs	Visual Type No./marking Dimension Capacitance value Leakage current	A	Verification	Sample	Manufacturer's spec. IS-590	IS-590	TC ↓	2	2	1	
			B	Verification	Sample				2	2	1	
			B	Measurement	Sample				2	2	1	
			C	Measurement	Sample				2	2	1	
C	Measurement	Sample	2	2	1							

ANNEXURE – G
QUALITY ASSURANCE PLAN FOR MAIN CONTROL CENTRE POWER SUPPLY DISTRIBUTION PANELS (SAMPLE)

Sl. No	Components and Operations	Characteristics	Class	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORDS	AGENCY			REMARKS	
									P	W	V		
14.	Ceramic disc capacitor/ metalised polyester capacitor/ tantalum capacitors	Visual Type No. / marking Dimension Capacitance value For ceramic disc capacitors	A B C C	Verification Verification Measurement Measurement Performance	Sample Sample Sample Sample	Manufacturer's spec. JSS-50203/ JSS-50204 JSS-50205 IS-8507	JSS-50206/ JSS-50204 JSS-50205 IS-8507	TC →	2 → → →	2 → → →	1 → → →		
15.	Flasher Relay (Solid State)	Visual Dimension Di-Electric Strength Insulation Resistance Setting Accuracy for the Set time Repeat Accuracy	As per NPCIL approved procedure	As per NPCIL approved test procedure	As per NPCIL approved test procedure	As per NPCIL approved test procedure	As per NPCIL approved test procedure	As per NPCIL approved test procedure					
16.	Flasher Failur Unit (Solid state)	Visual Dimension Di-Electric Strength Insulation Resistance Functional Test 100-hr Burn in	As per NPCIL approved procedure	As per NPCIL approved test procedure	As per NPCIL approved test procedure	As per NPCIL approved test procedure	As per NPCIL approved test procedure	As per NPCIL approved test procedure					
17.	Ground Fault Detection system	Refer Specification No. PB-E-249	Refer Specification No. PC-E-249	Refer Specification No. PC-E-249	Refer Specification No. PC-E-249	Refer Specification No. PC-E-249	Refer Specification No. PC-E-249	Refer Specification No. PC-E-249					

ANNEXURE – G

QUALITY ASSURANCE PLAN FOR MAIN CONTROL CENTRE POWER SUPPLY DISTRIBUTION PANELS (SAMPLE)

Sl. No	Components and Operations	Characteristics	Class	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORDS	AGENCY			REMARKS
									P	W	V	
18.	MCB status Monitoring system	Refer Specification No. PC-E-248	Refer Specification No. PC-E-248	Refer Specification No. PC-E-248	Refer Specification No. PC-E-248	Refer Specification No. PC-E-248	Refer Specification No. PC-E-248	Refer Specification No. PC-E-248				
19.	Handswitches (Selector)	Visual Dimension Operations Type no. / marking Insulation resistance Die-electric strength	B C C C C	Measurement Verification Performance Verification Measurement Performance	100% Sample 100% 100% 100% Sample	Manufacturer's Spec IS/IEC-60947-5	IS/IEC-60947-5	TC	2	2	1	
20.	Meters	Visual Dimensions Type no. / marking Accuracy Insulation Resistance	A B C C C	Verification Measurement Verification Measurement	100% Sample 100% 100%	Manufacturer's Spec. IS-1248/8573	IS-1248/8573	TC	2	2	1	

QUALITY ASSURANCE PLAN FOR MAIN CONTROL CENTRE POWER SUPPLY DISTRIBUTION PANELS (SAMPLE)

Sl. No	Components and Operations	Characteristics	Class	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORDS	AGENCY			REMARKS
									P	W	V	
21.	PTFE insulated Copper Wire including 22 AWG (30/7) silver copper conductor and PTFE insulated wire for MCB/SMS (auxiliary contact wiring)	Visual Dimensional insulation resistance Dielectric strength	A C C C	Verification Measurement Measurement Performance	Sample Sample Sample Sample	MIL-W-16878E	MIL-W-16878E	TC ↓	2 ↓	2 ↓	1 ↓	
22.	Electrical (wiring)	Routing of Wires Bunching, Ferruling, Crimping, Soldering, Clearance and colour Coding	Major	Visual	100%	Manufacture's Spec.	Manufacturer's Spec.	TC ↓	2 ↓	2 ↓	1 ↓	
23.	Painting	Pretreatment check Scratch hardness check Bend (Flexibility) Test Pull of Adhesion test Painting thickness check	C B B B B	Process Physical Mechanical Physical Measurement	Type test on test coupon Clause no. 3.0 of IS-101 Clause no. 2.0 of IS-101 Clause no. 5.0 of IS-101	PC-E-253 IS-101 IS-101 IS-101 PC-E-253	PC-E-253 IS-101 IS-101 IS-101 PC-E-253	TR ↓	2 ↓	2 ↓	1 ↓	CHP ↓

ANNEXURE -G
QUALITY ASSURANCE PLAN FOR MAIN CONTROL CENTRE POWER SUPPLY DISTRIBUTION PANELS (SAMPLE)

Sl. No	Components and Operations	Characteristics	Class	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORDS	AGENCY			REMARKS
									P	W	V	
24.	Final Assembly and pre testing	Dimension Component verification Layout verification Wiring Check Cable identification Insulation resistance Dielectric strength	Major Major Critical Major Critical Critical	Measurement	100%	Manufacturer's drawings	Manufacturer's drawings	TC	2	2	1	
				Verification	100%				2	2	1	
				Verification	100%				2	2	1	
				Continuity Verification	100%				2	2	1	
25.	Final Testing (a) Physical Verification	Presence of all items as per BOM	B	Visual	100%	Manufacturer's drawings	Manufacturer's drawings	TC	2	2	1	
26.	Test on system. Type Test	Dimension of modules and panels Connection checking of modules High Voltage Test on panels Functional test as per referred EDs	C B B B	Measurement	Sample	As per approved test procedure	As per approved test procedure	TR	2	2	1	CHP
				Performance	Sample				2	1	1	
				Performance	Sample				2	1	1	
				Performance	100%				2	1	1	

ANNEXURE -G

QUALITY ASSURANCE PLAN FOR MAIN CONTROL CENTRE POWER SUPPLY DISTRIBUTION PANELS (SAMPLE)

Sl. No	Components and Operations	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTU M OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORDS	AGENCY			REMARKS																
									P	W	V																	
27.	Acceptance tests	Dimensions of module, panels Insulation resistance test of panels and modules High voltage test of panel Functional test on panels	C	Measurement	100%	As per approved procedure	As per approved procedure	TR	2	2	1	CHP																
													B	Measurement	100%	As per approved procedure	TR	2	2	1								
																					B	Measurement	100%	As per approved procedure	TR	2	2	1
28.	Special type test	Environmental test EMC test MCB Coordination test Seismic Qualification	C	Performance	One sub assembly One panel & Flasher unit Each type Two panels	As per approved test procedure IEC-61000-5-7 PC-E-710	As per approved test procedure	TR	2	2,	1	CHP																
													C	Performance	IEC-61000-5-7 PC-E-710	TR	1	1	1									
																				C	Performance	As per approved test procedure	TR	1	1			
																										C	Performance	As per approved test procedure

LEGEND:

- P : Performed by
W : Witnessed by
V : Verified by
- A : Minor
B : Major
C : Critical
TC : Test Certificate
TR : Test Report
CHP : Customer Hold Point
- : 1. Purchaser
: 2. Prime Supplier
: 3. External Laboratory



ಭಾರತ್ ಹೆವಿ ಎಲೆಕ್ಟ್ರಿಕಲ್ಸ್ ಲಿಮಿಟೆಡ್
भारत हेवी इलेक्ट्रिकल्स लिमिटेड

Page 1 of 4

Bharat Heavy Electricals Ltd.,
(A Government of India undertaking)
Electronics Division

PB 2606 , Mysore Road Bangalore , 560026 INDIA

CE: PR: 003- Rev 00

SPECIAL COMMERCIAL CONDITIONS OF CONTRACT

Reference is brought to BHEL's Instructions to Bidders (Document Ref: CE: PR: 001- Rev 00) and General Commercial Conditions for Contract (Document Ref: CE: PR: 002- Rev 00). These documents along with required annexures are available in our website: www.bheledn.com. These two documents along with Special Conditions of Contract annexed to this RFQ will form an integral part of the contract as and when the RFQ culminates into a Purchase Order / Contract.

RFQ No: MGR0000030 RFQ Date: 09/09/2015
Due Date: 05/10/2015 Customer/Project : NPCIL/KAPP (2x700MWe)- TISCS (TG) Package for Units#3&4 and
NPCIL/RAPP (2x700MWe)- TISCS (TG) Package for Units#7&8

Item Description: 24V DC SCR based CHARGER SYSTEMS with DCDB & BHMS

Purchase Executives: In cases where tender documents are bulky, or due to some reasons tender documents are required to be submitted by hand, the offers are to be handed over to either of the following Purchase Officers:

Shri. Umapathi K, DGM, NEB-IIInd Floor, CE-MM/PR,BHEL-EDN or Mounish G, Engineer, NEB-IIInd Floor, CE-MM/PR,BHEL-EDN

E-mail IDs: In case offers are sent through E-mail, please send the offers to both of the following email IDs:

umapathi@bheledn.co.in & mounishg@bheledn.co.in

E-tendering: Applicable / Not Applicable.

Type Of Bid: Three-Part Bid system (Pre-Qualification Criteria-1st part, Techno-Commercial offer-2nd part, Priced offer-3rd part)

Reverse Auction: Not Applicable / Will be intimated during commercial clarifications to technically acceptable vendors meeting pre-qualification criteria.

In case BHEL does not resort to Reverse Auction, the price bids and price impacts (if any) shall be opened as per BHEL's standard practice.

Splitting of tendered quantity to MSE vendors: The tendered quantity will/will not be split to MSE vendors subject to submission of relevant documents by vendors. Refer clause H of Instructions to Bidders for conditions applicable and for information on documents to be submitted.

Destination: Items are to be directly despatched to BHEL's Site Office or Stores/Customer's Stores located at Kakrapar project site in Surat, Gujarat state and RAPP project site in Kota, Rajasthan state respectively.

Road Permit, if applicable, will be issued by BHEL along with Despatch Clearance.

Project Benefits:

• **Indigenous scope of supply:**

- ~~Project is Mega Power Project or Ultra Mega Power Project: Eligible for "NIL" Excise Duty. Necessary documents for availing Excise Duty exemption by suppliers will be furnished by BHEL.~~
- ~~Physical Export project: Eligible for complete exemption of Excise Duty & Sales Tax. Necessary documents for availing such benefits will be furnished by BHEL to suppliers.~~
- ~~Nuclear Power Project under a special category: Eligible for claiming Terminal Excise Duty benefit from DGFT as per present EXIM policy. Confirm submission of following in original:
 - Disclaimer Certificate (Annexure- XI)
 - Copy of Excise Invoice attested by Suptd of Central Excise authorities with signature and seal, in blue ink, to enable BHEL to claim terminal Excise duty benefit from DGFT.~~

Imported scope of supply:

- Project is Mega Power Project or Ultra Mega Power Project: Eligible for "NIL" Customs Duty. - Mega Power Projects
- ~~Physical Export project: Eligible for complete exemption of Customs Duty.~~

Terms of Delivery:

Indicate station of despatch: _____

Indicate place of manufacturing : _____

- **Indigenous scope of supply:** Ex-works(including Packing & Forwarding charges but excluding Taxes & Duties): _____(indicate station of dispatch)
- **Imported scope of supply:** F.C.A. (for air consignments) /F.O.B. (for sea consignments) (including Packing, Forwarding, Handling, Ancillary charges like processing of Sight Draft/ Letter of Credit, negotiation of bank documents, Export declaration, Country of Origin etc): _____

Note : Project status/duty benefits are same for both the projects. Any change in status/duty benefits of projects will be intimated before Price-bid opening.

S NO.	TERMS	BHEL ACCEPTABLE TERM	BIDDER'S CONFIRMATION	DEVIATION IF ANY
01	Validity	The offer will be valid for a period of 120 days from the date of technical bid opening.	AGREE	
02	Excise Duty ED is reimbursable by customer	<p>If applicable, indicate current rate of Excise Duty and maximum rate of Excise Duty (against proof of Excise Invoice).</p> <p>However, for calculation purpose and arriving at "Total Cost to BHEL" maximum rate of Excise Duty will be considered. In case Excise Duty remains firm throughout the contract, the same shall be specifically indicated. Otherwise, maximum Excise Duty will be considered for arriving at lowest bidder.</p> <p>However, reimbursement of Excise Duty shall be at actuals against proof of Excise Invoice (Within contractual delivery).</p> <p>Physical export contract eligible for complete exemption of Excise duty against submission of necessary documents by BHEL like ARE-1/CT-1 form.</p>	<p>APPLICABLE / NOT APPLICABLE</p> <p>Present rate of Excise Duty%</p> <p>Maximum rate of Excise Duty%</p>	
03	Central Sales Tax (CST) Concessional CST @ 2% is reimbursable by Customer	<p>If applicable, indicate current rate of sales tax against form "C".</p> <p>For issue of original form "C", vendor has to furnish "E1/E2" form. To enable vendor give E1/E2 form, photocopy of C form will be issued by BHEL.</p> <p>Please confirm submission of "E1/E2 Sale form".</p> <p>For physical export project, Sales Tax is exempted against necessary documents furnished by BHEL.</p>	<p>APPLICABLE / NOT APPLICABLE</p> <p>Present Sales Tax rate against form "C" %</p> <p>CONFIRMED</p>	
04	Value Added Tax (VAT) VAT is reimbursable by customer	<p>If applicable, indicate current rate of VAT.</p> <p>When VAT is applicable, BHEL ROD's/ Nodal Agency's Name, TIN No. and address to be indicated in invoice. (Note that two original invoice and one tax invoice should be submitted to BHEL).</p>	<p>APPLICABLE / NOT APPLICABLE</p> <p>VAT rate at present %</p> <p>NOTED</p>	
05	Octroi	If applicable, indicate current rate of octroi.	<p>AGREE</p> <p>Present Octroi rate%</p>	
06	Freight Charges (for indigenous scope of supply) Lumpsum Freight charges shall be quoted separately for each project in price-bid.	<p>Freight charges shall be to vendor's account.</p> <p>Quote lumpsum reasonable Freight charges separately in priced offer, plus service tax if any.</p> <p>Vendor's offer will be evaluated on "Total cost basis" including freight charges.</p> <p>Vendor shall book the consignment through their approved Road carriers on "Freight pre-paid" and door delivery consignee copy attached basis. Freight charges to be claimed from BHEL along with POD (Proof of Delivery) on original L/R.</p>	<p>AGREED and quoted as lumpsum amount in price bid.</p> <p>Service Tax ____% (extra /inclusive in freight charges)</p>	
07	Service Tax on E&C and Training charges	<p>If applicable, indicate current rate of Service Tax _____% Service Tax is reimbursable by customer.</p> <p>Service Tax Regn. No. _____</p> <p>Confirmation that Service Tax register is maintained.</p>	<p>APPLICABLE / NOT APPLICABLE</p> <p>CONFIRMED</p>	
08	Parting of license for imported raw	In case of Mega project, Ultra-Mega project and Physical Export project where Custom Duty and Excise Duty are	AGREE	

	materials Customs Duty is exempted on Imported items, being Mega Power projects.	NIL and vendor is importing any raw materials / components for the enquired item, same are eligible for Zero Customs duty. As per EXIM policy, BHEL will part the import licence with the vendors to obtain import licence by themselves and custom clear the raw materials/ components by availing zero customs duty. Hence, please furnish list of raw materials / components to be imported by you with Quantity and CIF value (for which BHEL has to share import licence). The benefit due to the above shall be passed on to BHEL and confirmed in the quotation. If there are no imported raw materials/components, same shall be confirmed in the offer.	CIF value Yes, benefit passed-on to BHEL in the priced quotation. We confirm that there are no imported components.	
09	Delivery Period *Staggered Delivery-RAPP	within 08 weeks from the date of issue of approved documents or manufacturing clearance by BHEL, whichever is later.-KAPP	AGREE weeks	
10	Guarantee/ Warranty	18 months from the date of delivery of goods or 12 months from the date of commissioning of goods, whichever is earlier.	AGREE	
11	Inspection agency	Materials will be inspected by : • BHEL • Customer/Consultant/BHEL nominated Third Party Inspection Agency (TPIA)	AGREE	
12	Terms of Payment at the time of material supply	Refer Clause "F" of Instructions to Bidder for BHEL standard Payment terms and loading factors applicable for non-compliance against payment terms: Indigenous Scope: a) Supply with E&C b) Supply with Supervision of E&C c) Supply only Imported Scope: d) Supply with E&C e) Supply with Supervision of E&C f) Supply only Note: Kindly indicate if High Sea Sales will be operated. If yes, confirm submission of relevant documents as per Annexure V.	AGREE YES / NO CONFIRMED	
13	Performance Bank Guarantee (PBG)	PBG will be applicable for a period of 18 months + claim period of 6 months for a value equal to 10% of the basic value of the purchase order. Refer Clause "G" of Instructions to Bidders.	AGREE	
14	Terms of Payment not related to material supply	For Training: 100% will be paid with 45 days credit from the date of Training or 15 days from the date of submission of complete set of documentation, whichever is later. Separate invoice shall be submitted for Training charges along with documentary evidence. For Engineering & Documentation Charges: 100% will be paid with 45 days credit from the date of approval of final documents or 15 days from the date of submission of invoice, whichever is later. Separate invoice to be submitted for Engineering & documentation charges.	AGREE	
15	Mode of despatch	Indigenous Scope: By Road on Door Delivery Consignee Copy attached basis through your approved transporter (unless otherwise indicated in Despatch Instructions), only on receipt of Despatch Clearance from BHEL. Imported Scope: By Air/Sea through BHEL approved Consolidator/Freight Forwarder, only on receipt of Despatch Clearance from BHEL.	AGREE	

*Delivery of items to RAPP should take place by June 2016 provided Manufacturing Clearance along with approved documents are issued before 08 weeks in advance, failing which the delivery period is within 08 Weeks from the date of issue of approved documents/Manufacturing Clearance, whichever is later. Penalty for delay in delivery will be applicable after 30/06/2016 provided document approval and MC is issued 08 weeks in advance otherwise, it will be applicable accordingly after 08 weeks from the date of document approval/MC whichever is later (as applicable for KAPP-Units#3&4 project).

16	Despatch Documents	<p>Complete set of despatch documents (original + 1 photocopy set) as per Purchase Order shall be forwarded to BHEL directly.</p> <p>Depending upon the project/customer demands, despatch documents may include one or more documents from the following: Commercial Invoice, Original attested Excise Invoice (if ED is applicable), Lorry Receipt (L/R), Packing List, Air Way Bill (AWB), Country of origin certificate, Warranty Certificate, Insurance Intimation letter, NIL Short Shipment Certificate, Original Performance Bank Guarantee (directly from issuing bank to BHEL), POD (Proof of Delivery) on original L/R, Disclaimer Certificate (as per BHEL format attached as Annexure XI) along with ER-1 form & attested excise invoice (as per project demands like Nuclear Power plant) etc.</p> <p>The precise list of despatch documents needed for a particular project will be specified in the Purchase Order.</p> <p>One set of Invoice, Packing List and L/R or AWB shall be e-mailed/faxed immediately to BHEL-EDN after despatch.</p>	AGREE	
17	O & M Manuals	<p>As built Drawings, O & M Manuals and other approved documents shall be furnished in required no. of sets as per Specification/Purchase Order.</p> <p>Note: Supply of above documents (O&M) in required no. of sets along with material shall be indicated in packing list. If not mentioned BHEL may insist for submission in required sets once again.</p>	AGREE	
18	Quantity Tolerance	<p>If applicable, indicate Quantity tolerance for each of the line item.</p> <p>For Impulse/seamless/ GI pipes one random length applicable for each variety of pipes.</p>	CONFIRMED	Quantity Tolerance % Per Variety
19	**Evaluation criteria for tendered item	<p>Itemwise evaluation of tendered item.</p> <p>Splitting of tendered quantity to MSE vendors (if any) is applicable.</p> <p>OR</p> <p>Items will not be split on unit/project-wise lowest offer. Items will be evaluated and procured as a package.</p>	AGREE	
20	Integrity Commitment	<p>Integrity commitment will be applicable in the tender process and execution of contracts as mentioned in clause "I" of Instructions to Bidders.</p>	AGREE	

****Even though evaluation of the Lowest bidder will be done on combined package basis, separate purchase orders will be placed for each project on the single finalized L1 bidder.**

With this, it is inferred that vendor has understood and accepts all terms & conditions as indicated in Instructions to Bidders (Document Ref: CE: PR: 001- Rev 00) & General Commercial Conditions for Contract (Document Ref: CE: PR: 002- Rev 00).

VENDOR'S SIGNATURE WITH SEAL

NOTE: The above filled-in and signed-sealed document (in original) shall be furnished as part of Part-I Bid without fail. If no deviations are brought, it will be treated as if all terms and conditions of this enquiry are accepted by vendor without any deviation.



ಭಾರತ ಹೆವಿ ಎಲೆಕ್ಟ್ರಿಕಲ್ಸ್ ಲಿಮಿಟೆಡ್
भारत हेवी इलेक्ट्रिकल्स लिमिटेड
Bharat Heavy Electricals Ltd.,
(A Government of India undertaking)
Electronics Division
PB 2606 , Mysore Road Bangalore , 560026 INDIA

CE: PR: 001- Rev 00

INSTRUCTIONS TO BIDDERS (Common for all RFQs)

Bidder is requested to read the instructions carefully and submit their quotation covering all the points:

A. GENERAL INSTRUCTIONS:

1. Any Purchase Order resulting from this enquiry shall be governed by the Instructions to Bidders (document reference: CE: PR: 001 – Rev 00), General Conditions of Contract (document reference: CE: PR: 002 - Rev 00) and Special Conditions of Contract, if any, of the enquiry.
2. Any deviations from or additions to the “General Conditions of Contract” or “Special Conditions of Contract” require BHEL’s express written consent. The general terms of business or sale of the bidder shall not apply to this tender.
3. Bidders (also includes the term suppliers / contractors wherever used in this document) are instructed to quote their most competitive price and best delivery, etc. in the offer. Prices should be indicated in both figures & words. **(Please also refer clause 11 under section B)**
4. Regret letter (either through post or by mail) indicating reasons for not quoting must be submitted without fail, in case of non-participation in this tender. If a bidder fails to respond against 3 consecutive tenders for the same item, he will be liable for removal as a registered vendor of BHEL.
5. Procurement directly from the manufacturers shall be preferred. However, if the OEM / Principal insist on engaging the services of an agent, such agent shall not be allowed to represent more than one manufacturer / supplier in the same tender. Moreover, either the agent could bid on behalf of the manufacturer / supplier or the manufacturer / supplier could bid directly but not both. In case bids are received from the manufacturer / supplier and his agent, bid received from the agent shall be ignored.
6. Consultant / firm (and any of its affiliates) shall not be eligible to participate in the tender/s for the related goods for the same project if they were engaged for consultancy services for the same project.
7. If an Indian representative / associate / liaison office quotes on behalf of a foreign based bidder, such representative shall furnish compulsorily the following documents:
 - a. Authorization letter to quote and negotiate on behalf of such foreign-based bidder.
 - b. Undertaking from such foreign based bidder that such contract will be honored and executed according to agreed scope of supply and commercial terms and conditions.
 - c. Undertaking shall be furnished by the Indian representative stating that the co-ordination and smooth execution of the contract and settlement of shortages / damages / replacement / repair of imported scope till system is commissioned and handed over to customer will be the sole responsibility of the Indian representative / associates / agent / liaison office.
 - d. Refer **Annexure X** on “Guidelines for Indian Agents”.
8. In case of imported scope of supply, customs clearance & customs duty payment will be to BHEL account after the consignment is received at Indian Airport / Seaport. Bidders must provide all original documents required for completing the customs clearance along with the shipment. Warehousing charges due to

incomplete or missing documentation will be recovered from the supplier's bill. All offers for imported scope of supply must be made from any of the gateway ports (within the country) indicated. **(Refer Annexure I)**

9. The offers of the bidders who are on the banned list and also the offers of the bidders, who engage the services of the banned firms, shall be rejected. The list of the banned firms is available on BHEL website: www.bhel.com
10. Business dealings with bidders will be suspended if they are found to have indulged in any malpractices / misconduct which are contrary to business ethics like bribery, corruption, fraud, pilferage, cartel formation, submission of fake/false/forged documents, certificates, information to BHEL or if they tamper with tendering procedure affecting the ordering process or fail to execute a contract, or rejection of 3 consecutive supplies or if their firms / works are under strike / lockout for a long period.

B. GUIDELINES FOR PREPARATION OF OFFER:

1. Quotation shall be submitted in Single Part Bid, Two Part Bid or Three Part Bid, as called for in the tender:
 - **SINGLE PART BID:** Technical and Commercial Bid with prices along with price summary & filled in BHEL Standard Commercial terms and conditions in a single sealed envelope.
 - **TWO PART BID:** Unpriced offer i.e. "Techno-commercial Bid" with filled in BHEL Standard Commercial terms and conditions in a sealed envelope **along with the copy of the "Price Bid" without the prices** should be enclosed in one cover and the cover must be super scribed "**Techno-commercial offer**" and Priced offer i.e. "Price Bid" containing price summary in a separate sealed envelope and must be super scribed "**Price Bid**". Both these envelopes shall be enclosed in a single sealed envelope super scribed with enquiry number due date of tender and any other details as called for in the tender document.
 - **THREE PART BID:** Pre-qualification Bid (Part-I), Techno Commercial Bid with filled in BHEL Standard Commercial terms and conditions (Part-II), and Price Bid (Part-III). All three envelopes shall be enclosed in a single sealed envelope super scribed with enquiry number due date of tender and any other details as called for in the tender document.

If any of the offers (Part I, Part II or Part III) are not submitted before the due date and time of submission or if any part of the offer is incomplete the entire offer of the bidder is liable for rejection.

2. Supplier shall ensure to super scribe each envelope with RFQ number, RFQ Date, RFQ Due date and time, Item Description and Project clearly & boldly. Also mention on the envelope whether it is "Techno Commercial Bid" or "Price Bid" or "Pre-Qualification Bid". Please ensure complete address, department name and purchase executive name is mentioned on the envelope (before dropping in the tender box or handing over) so that the tender is available in time for bid opening.
3. BHEL standard Commercial Terms and Conditions (duly filled, signed & stamped) must accompany Technical-Commercial offer without fail and should be submitted in original only. Xerox copy will not be accepted.
4. Any of the terms and conditions not acceptable to supplier, shall be explicitly mentioned in the Techno-Commercial Bid. If no deviations are brought out in the offer it will be treated as if all terms and conditions of this enquiry are accepted by the supplier without deviation.
5. Deviation to this specification / item description, if any, shall be brought out clearly indicating "DEVIATION TO BHEL SPECIFICATION" without fail, as a part of Techno-Commercial Bid. If no deviations are brought out in the offer it will be treated as if the entire specification of this enquiry is accepted without deviation.
6. Suppliers shall submit one set of original catalogue, datasheets, bill of materials, dimensional drawings, mounting details and / or any other relevant documents called in purchase specification as part of Technical Bid.
7. "Price Bid" shall be complete in all respects containing price break-up of all components along with all

applicable taxes and duties, packing & forwarding charges (if applicable), freight charges (if applicable) etc. Once submitted no modification / addition / deletion will be allowed in the "Price Bid." Bidders are advised to thoroughly check the unit price, total price to avoid any discrepancy.

8. In addition, bidder shall also quote for erection & commissioning charges (E&C charges), documentation charges, service charges, testing Charges (type & routine), training charges, service tax, etc. wherever applicable. The price summary must indicate all the elements clearly.
9. Vendors should indicate "lump sum" charges (including To & Fro Fare, Boarding, Lodging, Local Conveyance etc.) for Supervision of Erection, Commissioning and handing over to customer. The quotation shall clearly indicate scope of work, likely duration of commissioning, pre-commissioning checklist and service tax (if any).
10. Wherever bidders require PAC (Project Authority Certificate) for import of raw materials, components required for Mega Power Projects, Export Projects or other similar projects wherein supplies are eligible for customs duty benefits, lists and quantities of such items and their values (CIF) has to be mentioned in the offer. Prices must be quoted taking into account of such benefits.
11. All quotations shall be free from corrections /overwriting. Corrections if any should be authenticated with signature and seal. Any typographical error, totaling mistakes, currency mistake, multiplication mistake, summing mistakes etc. observed in the price bids will be evaluated as per **Annexure II** "Guidelines for dealing with Discrepancy in Words & Figures – quoted in price bid". BHEL decision will be final.

C. GUIDELINES FOR OFFER SUBMISSION:

1. Offers / Quotations must be dropped in tender box before 13.00 Hrs. on or before due date mentioned in RFQ. The offers are to be dropped in the proper slot of the Tender Box kept in our reception area with caption "CE, SC&PV, DEFENCE." Tenders are opened on 3 days in a week (Monday/Wednesday/Friday). Tender must be deposited in the slot corresponding to the day (Monday - Box no.4/Wednesday - Box no. 6 /Friday - Box no.8) while depositing the offer. **(This clause will not be applicable for e-tenders)**
2. E-Mail / Internet / EDI offers received in time shall be considered only when such offers are complete in all respects. In case of offers received through E-mail, please send the offer to the email ID specified in the SCC of the tender. (Refer to SCC document of tender)
3. In cases where tender documents are bulky, or due to some reasons tender documents are required to be submitted by hand or through posts/couriers, the offers are to be handed over either of the two officers whose names are mentioned in the RFQ. (Refer to SCC document of tender)
4. Tenders will be opened on due date, time and venue as indicated in the RFQ in the presence of bidders at the venue indicated in the RFQ. In case of e-procurement, bidders can see tender results till seven days after due date and time.
5. Vendor will be solely responsible:
 - a. For submission of offers before due date and time. Offers submitted after due date and time will be treated as "Late offers" and will be rejected.
 - b. For submission of offers in the correct compartment of the tender box based on the day of due date (Monday/Wednesday/Friday). Please check before dropping your offer in the correct tender box.
 - c. For depositing offers in proper sealed condition in the tender box. If the bidder drops the tender in the wrong tender box or if the tender document is handed over to the wrong person BHEL will not be responsible for any such delays.
 - d. For offers received through email etc., suppliers are fully responsible for lack of secrecy on information and ensuring timely receipt of such offers in the tender box before due date & time.
 - e. In case of e-tender, all required documents should be uploaded before due date and time. Availability of power, internet connections, etc. will be the sole responsibility of the vendor. Wherever assistance is

needed for submission of e-tenders, help line numbers and executives of service provider of BHEL may be contacted.

Service provider: M-junction

Website address: <https://bheleps.buyjunction.in/>

Helpline no.: 033-66106426/6217/6013/6046/6176 (9:30 am to 5:30 pm)

9163348283/9163348284/9163348285/9163348286/8584008116 (5:30 pm to 8:30 pm)

Purchase Executive / BHEL will not be responsible for any of the activities relating to submission of offer.

D. PROCESSING OFFERS RECEIVED:

1. Any discount / revised offer submitted by the supplier on its own shall be accepted provided it is received on or before the due date and time of offer submission (i.e. Part-I bid). The discount shall be applied on pro-rata basis to all items unless specified otherwise by the bidder.
2. Changes in offers or Revised offers given after Part-I bid opening shall not be considered as a part of the original offer unless such changes / revisions are requested by BHEL.
3. In case there is no change in the technical scope and / or specifications and / or commercial terms & conditions, the supplier will not be allowed to change any of their bids after Technical bids are opened (after the due date and time of tender opening).
4. In case of changes in scope and/ or technical specifications and/ or commercial terms & conditions by BHEL and it accounts for price implications from vendors, all techno-commercially acceptable bidders shall be asked by BHEL (after freezing the scope, technical specifications and commercial terms & conditions) to submit the impact of such changes on their price bid. Impact price will be applicable only for changes in technical specification / commercial conditions by BHEL. The impact price must be submitted on or before the cut-off date specified by BHEL and the original price bid and the price impact bid will be opened together at the time of price bid opening.
5. BHEL EDN reserves the right to adopt Reverse Auction or standard Price Bid Opening procedure for price evaluation, at its discretion. This will be decided after completion of technical evaluation of tender. **(Refer Annexure III for Guidelines for Reverse Auction).**
6. Un-opened bids (including price bids) will be returned to the respective bidders after release of PO and receipt of order acknowledgement from the successful bidder.
7. After receipt of Purchase Order, supplier should submit required documents like drawings, bill of materials, datasheets, catalogues, quality plan, test procedure, type test report , O & M Manuals and / or any other relevant documents as per Specification / Purchase Order, as and when required by BHEL / Customer.
8. Any deviation to the terms and conditions not mentioned in the quotation by supplier in response to this enquiry will not be considered, if put forth subsequently or after issue of Purchase Order, unless clarification is sought for by BHEL EDN and agreed upon in the Purchase Order.
9. Evaluation shall be on the basis of delivered cost (i.e. "Total Cost to BHEL").
"Total Cost to BHEL" shall include total basic cost, packing & forwarding charges, taxes and duties, freight charges, insurance, service tax for services, any other cost indicated by vendor for execution of the contract and loading factors (for non-compliance to BHEL Standard Commercial Terms & Conditions). Benefits arising out of Nil Import Duty on Mega Projects, Physical Imports or such 100% exemptions (statutory benefits), customer reimbursements of statutory duties (like Excise Duty, CST, VAT) will also be taken into account at the time of tender evaluation. (wherever applicable and as indicated in SCC document of tender)

10. For evaluation of offers in foreign currency, the exchange rate (TT selling rate of SBI) shall be taken as under:
- Single part bids: Date of tender opening
 Two/three part bids: Date of Part-I bid opening
 Reverse Auction: Date of Part-I bid opening
- In case of Performance Bank Guarantee (PBG) also, exchange rate will be considered as mentioned above for converting foreign currency to Indian currency and vice versa.
- If the relevant day happens to be a bank holiday, then the exchange rate as on the previous working day of the bank (SBI) shall be taken.
11. Ranking (L-1, L-2 etc.) shall be done only for the techno-commercially acceptable offers.

E. INFORMATION ON PAYMENT TERMS:

1. All payments will be through Electronic Fund transfer (EFT). Vendor has to furnish necessary details as per BHEL standard format (**Refer Annexure IV**) for receiving all payments through NEFT. (Applicable for Indian vendors only)
2. In case of High Sea Sales transaction, customs clearance of the consignment landed on Indian Sea / Air ports will be done by BHEL based on the original HSS documents provided by vendors. All warehousing charges due to delay in submission of complete and or correct HSS documents to BHEL will be to suppliers account only. Such recovery will be made out of any of the available bills. (**Refer Annexure V**).
3. Statutory deductions, if any, will be made and the deduction certificate shall be issued. In case vendor does not provide PAN details, the TDS deduction shall be at the maximum percentage stipulated as per the provisions of Income Tax Act. (Applicable for Indian vendors only).
Foreign vendors shall submit relevant details of their bankers like Swift Code, Banker's Name & Address etc.
4. Vendors must submit bills & invoices along with required supporting documents in time. Incomplete documentation / delayed submission of invoice / documents will result in corresponding delay in payment.

F. STANDARD PAYMENT TERMS OF BHEL-EDN

Purchase Orders for indigenous procurement

(a) SUPPLY WITH E&C:

- 1) 85% of basic value (excluding E&C charges) + 100% of taxes, duties and freight charges will be paid with 45 days credit from the date of dispatch or 15 days from the date of submission of complete set of documentation whichever is later.
- 2) 15% of basic value (retention money), (excluding E&C charges) will be paid with 15 days credit from the date of submission of documents against supplementary invoice with proof of completion of E&C along with E & C charges (if any).

(b) SUPPLY WITH SUPERVISION OF E&C:

- 1) 90% basic value (excluding E&C charges) + 100% of taxes, duties and freight charges will be paid with 45 days credit from the date of dispatch or 15 days from the date of submission of complete set of documentation whichever is later.
- 2) 10% of basic value (retention money), (excluding E&C charges) will be paid with 15 days credit from the date of completion of erection and commissioning against supplementary invoice with proof of completion of E&C along with supervision charges (if any)

(c) SUPPLY ONLY:

- 1) 100% of PO value with taxes, duties and freight will be paid with 45 days credit from the date of dispatch or 15 days from the date of submission of complete set of documentation whichever is later.

Purchase orders for import procurement:

(d) SUPPLY WITH E&C:

- 1) 85% of the basic value (excluding E&C charges) will be paid with 45 days credit, against usance draft of 45 days, from the date of AWB/BOL on submission of complete set of documents.
- 2) 15% of basic value (retention money), (excluding E&C charges) will be paid with 15 days credit from the date of completion of E&C along with E & C charges against supplementary invoice with proof of completion of E&C.

(e) SUPPLY WITH SUPERVISION OF E&C:

- 1) 90% of the value of the order will be paid on the 45th day, against usance draft of 45 days, from the date of AWB/BOL on submission of complete set of documents.
- 2) 10% of basic value (retention money) will be paid with 15 days credit from the date of completion of erection and commissioning against supplementary invoice with proof of completion of E&C along with supervision charges (if any).

(f) SUPPLY ONLY:

- 1) 100% of PO value will be paid against usance draft of 45 days from the date of dispatch or 15 days from the date of submission of complete set of documents whichever is later.

LOADING FACTORS FOR PAYMENT TERMS:

- 1) For offers received with requests for negotiation of documents through bank loading will be 15% of basic value (all bank charges to be borne by the seller).
(This loading factor is applicable only for purchase orders for indigenous supply).
- 2) In all cases where credit period is 30 days but not in line with the above mentioned standard payment terms offered loading applicable will be 5% of basic value.
(This loading factor is applicable only for purchase orders for indigenous supply).
- 3) For offers received with Letter of Credit payment term in place of sight draft payment term, loading applicable will be 5% of basic value. Additional loading of 5% will be applicable for payment terms as Letter of Credit with usance of less than 45 days.
(This loading factor is applicable only for purchase orders for imported supply).
- 4) For offers received with Sight Draft payment terms with usance of less than 45 days, loading of 5% will be applicable.
(This loading factor is applicable only for purchase orders for imported supply).
- 5) All payment terms with credit period of less than 30 days for indigenous supply and any other variation of payment terms are liable for rejection.
- 6) Standard payment terms indicated in para F (a), (b), (c), (d), (e) and (f) will not attract any loading.

Note 1: Basic value of Purchase Order mentioned above will include all components of the purchase order and will exclude only taxes, duties, freight and E&C charges (wherever applicable).

Wherever the Purchase Order is split into import portion and indigenous portion of supply the retention money will be 15% or 10% (as applicable) of both purchase order values put together.

Note 2: *If the E&C could not be completed till the end of the Warranty period due to reasons not attributable to the supplier, BHEL may consider releasing the retention money to the supplier against Bank Guarantee for equivalent value valid for an initial period of one year.*

G. Bank guarantee (BG) / Performance bank guarantee (PBG):

1. Bank guarantee (BG) / Performance bank guarantee (PBG) will be applicable as called in the tender documents. Such PBG shall be valid for a period of 18 months + claim period of 6 months for a value equal to 10 % of the basic value of the purchase order. No deviation for the duration of PBG / BG will be permitted.
 - a. PBG shall be from any of the BHEL consortium of bankers (**refer Annexure VI**).
 - b. PBGs from nationalized banks are also acceptable.
 - c. PBG should be sent directly by the bank to the dealing executive mentioned in the purchase order located at the address mentioned in the purchase order. PBG should be in the format indicated. (**Refer annexures VII & VIII respectively**). No deviation to these formats will be allowed.
 - d. Confirmation from any of the BHEL consortium of banks or any of the Indian Public Sector Banks is essential for the acceptance of PBGs issued by foreign banks (located outside India).
 - e. Expired BGs / PBGs will be returned only after expiry of the claim period or on completion of the contractual obligation.
 - f. **Non acceptance for submission of PBG will attract loading as indicated below**
 - i. Loading will be equal to the percentage of value for which BG / PBG is not provided. (Ex: if PBG / BG is given for 3 % of the basic value against 10% specified, loading applicable will be 7% (10 – 3 = 7 %). This value will be added to the quoted price while evaluating the lowest offer.

H. PROVISIONS APPLICABLE FOR MSE VENDORS (MICRO AND SMALL ENTERPRISES)

Vendors who qualify as MSE vendors are requested to submit applicable certificates (as specified by the Ministry of Micro, Small and Medium Enterprises) at the time of vendor registration. Vendors have to submit any of the following documents along with the tender documents in the Part I / Technical bid cover to avail the applicable benefits.

- a. Valid NSIC certificate or
- b. Entrepreneur's Memorandum part II (EM II) certificate (deemed valid for 2 years).
- c. EM II certificate with CA certificate (**in the prescribed format given in Annexure IX**) applicable for the year certifying that the investment in plant and machinery of the vendor is within permissible limits as per the MSME Act 2006 for relevant status where the deemed validity is over.
- d. Documents submitted for establishing the credentials of MSE vendors must be valid as on the date of part I / technical bid opening for the vendors to be eligible for the benefits applicable for MSE vendors. Documents submitted after the Part I / Technical bid opening date will not be considered for this tender.

PURCHASE PREFERENCE FOR MSE VENDORS:

- e. MSE vendors quoting within a price band of L1 + 15% shall be allowed to supply up to 20% of the requirement against this tender provided
 1. The MSE vendor matches the L1 price
 2. L1 price is from a non MSE vendor
 3. L1 price will be offered to the nearest vendor nearest to L1 in terms of price ranking (L2 - nearest to L1). In case of non-acceptance by the MSE vendor (L2) next ranking MSE vendor will be offered who is within the L1 + 15% band (if L3 is also within 15% band).
 4. 20% of the 20% (i.e. 4% of the total enquired quantity) will be earmarked for SC/ST owned MSE firms provided conditions as mentioned in (1) and (2) are fulfilled.

5. In case no vendor under SC / ST category firms are meeting the conditions mentioned in (1) and (2) or have not participated in the tender, in such cases the 4% quantity will be distributed among the other eligible MSE vendors who have participated in the tender.
6. Serial no. 1 to 5 will not be applicable wherever it is not possible to split the tendered quantity / items on account of customer contract requirement, or the items tendered are systems. Such information that tendered quantity will not be split will be indicated in the SCC.

I. INTEGRITY COMMITMENT IN THE TENDER PROCESS, AND EXECUTION OF CONTRACTS:

1. Commitment by BHEL:

BHEL commits to take all measures necessary to prevent corruption in connection with the Tender process and execution of the Contract. BHEL will, during the tender process, treat all bidder / suppliers in a transparent and fair manner, and with equity.

2. Commitment by Bidder(s)/ Contractor(s):

- a. The Bidder(s)/ Contractor(s) commit(s) to take all measures to prevent corruption and will not directly or indirectly try to influence any decision or benefit which he is not legally entitled to.
- b. The Bidder(s)/ Contractor(s) will not enter with other Bidder(s) into any undisclosed agreement or understanding or any actions to restrict competition.
- c. The Bidder(s)/ Contractor(s) will not commit any offence under the relevant Acts. The Bidder(s)/ Contractor(s) will not use improperly, for purposes of competition or personal gain or pass on to others, any information or document provided by BHEL as part of business relationship.
- d. The Bidder(s)/ Contractor(s) will, when presenting his bid, disclose any and all payments he has made, and is committed to or intends to make to agents, brokers or any other intermediaries in connection with the award of the contract and shall adhere to the relevant guidelines issued from time to time by Government of India/ BHEL.

If the Bidder(s) / Contractor(s), before award or during execution of the Contract commit(s) a transgression of the above or in any other manner such as to put his reliability or credibility in question, BHEL is entitled to disqualify the Bidder(s) / Contractor (s) from the tender process or terminate the contract and/ or take suitable action as deemed fit.

for BHEL-EDN
Mounish G
PURCHASE EXECUTIVE



ಭಾರತ ಹೆವಿ ಎಲೆಕ್ಟ್ರಿಕಲ್ಸ್ ಲಿಮಿಟೆಡ್
भारत हेवी इलेक्ट्रिकल्स लिमिटेड

Bharat Heavy Electricals Ltd.,
(A Government of India undertaking)
Electronics Division

PB 2606 , Mysore Road Bangalore , 560026 INDIA

CE: PR: 002- Rev 00

GENERAL COMMERCIAL CONDITIONS FOR CONTRACT

These 'General Commercial Conditions for Contract for Purchase' hereinafter referred to as GCC apply to all enquiries, tenders, requests for quotations, orders, contracts and agreements concerning the supply of goods and the rendering of related services (hereinafter referred to as "deliveries") to Bharat Heavy Electricals Limited and any of its units, regions or divisions (hereinafter referred to as "BHEL" or the Purchaser) or its projects / customers.

Any deviations from or additions to these GCC require BHEL's express written consent. The general terms of business or sale of the vendor shall not apply to BHEL. Acceptance, receipt of shipments or services or effecting payment shall not mean that the general terms of business or sale of the vendor have been accepted.

Orders, agreements and amendments thereto shall be binding if made or confirmed by BHEL in writing. Only the Purchasing department of BHEL is authorized to issue the Purchase Order or any amendment thereof.

Definitions: Throughout these conditions and in the specifications, the following terms shall have the meanings assigned to them, unless the subject matter or the context requires otherwise.

- a) 'The Purchaser' means Bharat Heavy Electricals Limited, Electronics division, Mysore road, Bangalore 560 026, a Unit of Bharat Heavy Electricals Limited (A Govt. of India Undertaking) incorporated under the Companies Act having its registered office at BHEL House, Siri Fort, New Delhi-110049, India and shall be deemed to include its successors and assigns. It may also be referred to as BHEL.
- b) 'The vendor' means the person, firm, company or organization on whom the Purchase Order is placed and shall be deemed to include the vendor's successors, representative heirs, executors and administrator as the case may be. It may also be referred to as Seller, Contractor or Supplier.
- c) 'Contract' shall mean and include the Purchase Order incorporating various agreements, viz. tender/ RFQ, offer, letter of intent / acceptance / award, the General Conditions of Contract and Special Conditions of Contract for Purchase, Specifications, Inspection / Quality Plan, Schedule of Prices and Quantities, Drawings, if any enclosed or to be provided by BHEL or his authorized nominee and the samples or patterns if any to be provided under the provisions of the contract.
- d) 'Parties to the Contract' shall mean the 'The Vendor' and the Purchaser as named in the main body of the Purchase Order.

Interpretation:

In the contract, except where the context requires otherwise:

- a) words indicating one gender include all genders;
- b) words indicating the singular also include the plural and words indicating the plural also include the singular;
- c) provisions including the word "agree", "agreed" or "agreement" require the agreement to be recorded in writing, and
- d) "Written" or "in writing" means hand-written, type-written, printed or electronically made, and resulting in a permanent record.

Applicable Conditions:

1. **Price Basis:** All prices shall be firm until the purchase order is executed / completed in all respects. No price variations / escalation shall be permitted unless otherwise such variations / escalations are provided for and agreed by BHEL in writing in the purchase order.
2. **Validity:** The offer will be valid for a period of 120 days from the date of technical bid opening date. Validity beyond 120 days, if required, will be specified in the SCC (special conditions of contract).
3. **Ordering and confirmation of Order:** Vendor shall send the order acceptance on their company letter head within two weeks from the date of Purchase Order or such other period as specified / agreed by BHEL. BHEL reserves the right to revoke the order placed if the order confirmation differs from the original order placed. The acceptance of goods/services/supplies by BHEL as well as payments made in this regard shall not imply acceptance of any deviations.
The purchase order will be deemed to have been accepted if no communication to the contrary is received within two weeks (or the time limit as specified / agreed by BHEL) from the date of the purchase order.
4. **Documentation:** After receipt of Purchase Order, vendor should submit required documents like drawings, bill of materials, datasheets, catalogues, quality plan, test procedure, type test report , O & M Manuals and/or any other relevant documents as per Specification/Purchase Order, as and when required by BHEL/Customer.
At any stage within the contract period, the vendor shall notify of any error, fault or other defect found in BHEL's documents /specifications or any other items for reference. If and to the extent that (taking account of cost and time) any vendor exercising due care would have discovered the error, fault or other defect when examining the documents/specifications before submitting the tender, the time for completion shall not be extended. However if errors, omissions, ambiguities, inconsistencies, inadequacies or other defects are found in the vendor's documents, they shall be corrected at his cost, notwithstanding any consent or approval.
5. **Penalty:**
For delay in documentation: In the event of delay in submission of complete set of documents ((like drawings, bill of materials, datasheets, catalogues, quality plan etc. as called in tender specifications including soft copies wherever applicable) in required sets beyond three weeks (or as agreed/indicated in the Purchase Order) from the date of Purchase Order, penalty at 0.5% (half percent) per week or part thereof, limited to a maximum of 5% (five percent) of the basic material value of the Purchase Order will be applicable.

For delay in delivery: In the event of delay in agreed contractual delivery as per Purchase Order, penalty @ 0.5 % (half percent) per week or part thereof but limited to a max of 10% (ten percent) value of undelivered portion (basic material cost) will be applicable. Delivery will commence from the date of document approval by customer / BHEL or date of issue of manufacturing clearance, whichever is later. The date for which Inspection call is issued by vendor along with test certificates / test reports / Certificate of Conformance / calibration reports, as proof of completion of manufacturing will be treated as date of deemed delivery for penalty calculation. In the absence of furnishing such document indicated above as proof of completion of manufacturing along with inspection call, actual date of inspection will be considered as date of deemed delivery and BHEL will not be responsible for delay in actual date of inspection.

Penalty for delayed documentation/delayed delivery, if applicable, shall be deducted at the time of first payment. If penalty is applicable for duration of less than a week, penalty @ 0.5% (half percent) of the basic material value will be deducted.
6. **Contract variations (Increase or decrease in the scope of supply):** BHEL may vary the contracted scope as per requirements at site. If vendor is of the opinion that the variation has an effect on the agreed price or delivery period, BHEL shall be informed of this immediately in writing along with technical details. Where unit rates are available in the Contract, the same shall be applied to such additional work. Vendor shall not

perform additional work before BHEL has issued written instructions / amendment to the Purchase Order to that effect. The work which the vendor should have or could have anticipated in terms of delivering the service(s) and functionality (i.e.) as described in this agreement, or which is considered to be the result of an attributable error on the vendor's part, shall not be considered additional work.

7. Reverse Auction: BHEL reserves the right to follow REVERSE AUCTION PROCEDURE (ONLINE BIDDING ON NETWORK) before finalising the Purchase order on technically competent bidders, as per the guidelines given in Annexure III. In case BHEL does not resort to Reverse Auction, the price bids and price impacts (if any) already submitted and available with BHEL shall be opened as per BHEL's standard practice.
8. Inspection: Prior written notice of at least 10 days shall be given along with internal test certificates / COC and applicable test certificates. Materials will be inspected by BHEL-EDN-QS/CQS or BHEL nominated Third Party Inspection Agency (TPIA) or BHEL authorized Inspection Agency or Customer / Consultant or jointly by BHEL & Customer / consultant. All tests have to be conducted as applicable in line with approved Quality plan or QA Checklist or Purchase specification and original reports shall be furnished to BHEL-EDN, Bangalore for verification / acceptance for issue of dispatch clearance.
All costs related to inspections & re-inspections shall be borne by vendor. Whether the Contract provides for tests on the premises of the vendor or any of his Sub-contractor/s, vendor shall be responsible to provide such assistance, labour, materials, electricity, fuels, stores, apparatus, instruments as may be required and as may be reasonably demanded to carry out such tests efficiently. Cost of any type test or such other special tests shall be borne by BHEL only if specifically agreed to in the purchase order.
9. Transit Insurance: Transit insurance coverage between vendor's works and project site shall be to the account of BHEL, unless specifically agreed otherwise. However, vendor shall send intimation directly to insurance agency (as mentioned in dispatch instructions issued by BHEL) through fax/courier/e-mail, immediately on dispatch of goods for covering insurance. A copy of such intimation sent by vendor to insurance agency shall be given to BHEL along with dispatch documents. Dispatch documents will be treated as incomplete without such intimation copy. BHEL shall not be responsible for sending intimations to insurance agency on behalf of the vendor.
10. High Sea Sales (HSS): Customs clearance of the consignment landed on Indian Sea / Air ports will be done by BHEL based on the original HSS documents provided by vendors.
Any delay in submission of complete / correct HSS documents to BHEL may incur demurrage charges. All demurrage charges on account of incomplete / incorrect HSS documents submission by vendor will be to vendor's account and all such charges will be recovered from any of the available vendor bills with BHEL.
11. Packaging and dispatch: The Seller shall package the goods safely and carefully and pack them suitably in all respects considering the peculiarity of the material for normal safe transport by Sea / Air / Rail / Road to its destination suitably protected against loss, damage, corrosion in transit and the effect of tropical salt laden atmosphere. The packages shall be provided with fixtures / hooks and sling marks as may be required for easy and safe handling. If any consignment needs special handling instruction, the same shall be clearly marked with standard symbols / instructions. Hazardous material should be notified as such and their packing, transportation and other protection must conform to relevant regulations.
The packing, shipping, storage and processing of the goods must comply with the prevailing legislation and regulations concerning safety, the environment and working conditions. Any Imported/Physical Exports items packed with raw / solid wood packing material should be treated as per ISPM – 15 (fumigation) and accompanied by Phytosanitary / Fumigation certificate. If safety information sheets (MSDS – Material Safety Data Sheet) exist for an item or the packaging, vendor must provide this information without fail along with the consignment.
Each package must be marked with Consignee name, Purchase order number, Package number, Gross weight and net weight, dimensions (L x B x H) and Seller's name. Packing list of goods inside each package with PO item number and quantity must also be fixed securely outside the box to indicate the contents of each box. Total number of packages in the consignment must also be indicated.
Separate packing & identification of items should be as follows.
 1. Main Scope - All items must be tagged with part no. & item description.
 2. Commissioning spares - All items must be tagged with part no. & item description.
 3. Mandatory spares - All items must be tagged with part no. & item description.

12. Assignment of Rights & Obligations; Subcontracting: Vendor is not permitted to subcontract the delivery or any part thereof to third party or to assign the rights and obligations resulting from this agreement in whole or in part to third parties without prior written permission from BHEL. Any permission or approval given by the BHEL shall, however, not absolve the vendor of the responsibility of his obligations under the Contract.
13. Progress report: Vendor shall render such report as to the progress of work and in such form as may be called for by the concerned purchase officer from time to time. The submission and acceptance of such reports shall not prejudice the rights of BHEL in any manner.
14. Non-disclosure and Information Obligations: Vendor shall provide with all necessary information pertaining to the goods as it could be of importance to BHEL. Vendor shall not reveal confidential information that may be divulged by BHEL to Vendor's employees not involved with the tender/ contract & its execution and delivery or to third parties, unless BHEL has agreed to this in writing beforehand. Vendor shall not be entitled to use the BHEL name in advertisements and other commercial publications without prior written permission from BHEL.
15. Cancellation / Termination of contract: BHEL shall have the right to completely or partially terminate the agreement by means of written notice to that effect. Termination of the Contract, for whatever reason, shall be without prejudice to the rights of the parties accrued under the Contract up to the time of termination.
BHEL shall have the right to cancel/foreclose the Order/ Contract, wholly or in part, in case it is constrained to do so, on account of any decline, diminution, curtailment or stoppage of the business.
16. Risk Purchase Clause: In case of failure of supplier, BHEL at its discretion may make purchase of the materials / services NOT supplied / rendered in time at the RISK & COST of the supplier. Under such situation, the supplier who fails to supply the goods in time shall be wholly liable to make good to BHEL any loss due to risk purchase.
In case of items demanding services at site like erection and commissioning, vendor should send his servicemen /representatives within 7 days from the service call. In case a vendor fails to attend to the service call, BHEL at its discretion may also make arrangements to attend such service by other parties at the RISK & COST of the supplier. Under such situation the supplier who fails to attend the service shall be wholly liable to make good to BHEL any loss due to risk purchase / service including additional handling charges due to the change.
17. Shortages: In the event of shortage on receipt of goods and/or on opening of packages at site, all such shortages shall be made good within a reasonable time that BHEL may allow from such intimation and free of cost. In case BHEL raises an insurance claim, the cost of material limited to insurance settled amount less handling charges will have to be reimbursed by the Supplier.
Transit Damages: In the event of receipt of goods in damaged condition or having found them so upon opening of packages at site, Supplier shall make good of all such damages within a reasonable time from such intimation by BHEL. In case BHEL raises an insurance claim, the cost of material limited to insurance settled amount less handling charges will be reimbursed.
18. Remedial work: Notwithstanding any previous test or certification, BHEL may instruct the vendor to remove and replace materials/goods or remove and re-execute works/services which are not in accordance with the purchase order. Similarly BHEL may ask the vendor to supply materials or to execute any services which are urgently required for any safety reasons, whether arising out of or because of an accident, unforeseeable event or otherwise. In such an event, Vendor shall provide such services within a reasonable time as specified by BHEL.
19. Indemnity Clause: Vendor shall comply with all applicable safety regulations and take care for the safety of all persons involved. Vendor is fully responsible for the safety of its personnel or that of his subcontractor's men / property, during execution of the Purchase Order and related services. All statutory payments including PF, ESI or other related charges have to be borne by the vendor. Vendor is fully responsible for ensuring that all legal compliances are followed in course of such employment.

20. Product Information, Drawings and Documents: Drawings, technical documents or other technical information received by Vendor from BHEL or vice versa shall not, without the consent of the other party, be used for any other purpose than that for which they were provided. They may not, without the consent of the Disclosing party, otherwise be used or copied, reproduced, transmitted or communicated to third parties. All information and data contained in general product documentation, whether in electronic or any other form, are binding only to the extent that they are by reference expressly included in the contract.

Vendor, as per agreed date/s but not later than the date of delivery, provide free of charge information and drawings which are necessary to permit and enable BHEL to erect, commission, operate and maintain the product. Such information and drawings shall be supplied in as many numbers of copies as may be agreed upon.

All intellectual properties, including designs, drawings and product information etc. exchanged during the formation and execution of the Contract shall continue to be the property of the disclosing party.

21. Intellectual Property Rights, Licenses: If any Patent, design, Trade mark or any other intellectual property rights apply to the delivery (goods / related service) or accompanying documentation shall be the exclusive property of the Vendor and BHEL shall be entitled to the legal use thereof free of charge by means of a non-exclusive, worldwide, perpetual license. All intellectual property rights that arise during the execution of the Purchase Order/ contract for delivery by vendor and/or by its employees or third parties involved by the vendor for performance of the agreement shall belong to BHEL. Vendor shall perform everything necessary to obtain or establish the above mentioned rights. The Vendor guarantees that the delivery does not infringe on any of the intellectual property rights of third parties. The Vendor shall do everything necessary to obtain or establish the alternate acceptable arrangement pending resolution of any (alleged) claims by third parties. The Vendor shall indemnify BHEL against any (alleged) claims by third parties in this regard and shall reimburse BHEL for any damages suffered as a result thereof.

22. Force Majeure: Notwithstanding anything contained in the purchase order or any other document relevant thereto, neither party shall be liable for any failure or delay in performance to the extent said failures or delays are caused by the "Act of God" and occurring without its fault or negligence, provided that, force majeure will apply only if the failure to perform could not be avoided by the exercise of due care and vendor doing everything reasonably possible to resume its performance.

A party affected by an event of force majeure which may include fire, tempest, floods, earthquake, riot, war, damage by aircraft etc., shall give the other party written notice, with full details as soon as possible and in any event not later than seven (7) calendar days of the occurrence of the cause relied upon. If force majeure applies, dates by which performance obligations are scheduled to be met will be extended for a period of time equal to the time lost due to any delay so caused.

Notwithstanding above provisions, in an event of Force Majeure, BHEL reserves for itself the right to cancel the order/ contract, wholly or partly, in order to meet the overall project schedule and make alternative arrangements for completion of deliveries and other schedules.

23. Guarantee / Warranty: Wherever required, and so provided in the specifications / Purchaser Order, the Seller shall guarantee that the stores supplied shall comply with the specifications laid down, for materials, workmanship and performance. Unless otherwise specified, guarantee / warranty period shall be 30 months after the date of delivery of goods or 24 months from the date of commissioning of goods whichever is earlier. The guarantee / warranty period as described above shall apply afresh to replaced, repaired or re-executed parts of a delivery. Unless otherwise specifically provided in the Purchase Order, Vendor's liability shall be co terminus with the expiration of the applicable guarantee / warranty period.

24. Limitation of Liability: Vendor's liability towards this contract is limited to a maximum of 100% of the contract value and consequential damages are excluded. However the limits of liability will have no effect in cases of criminal negligence or wilful misconduct.

The total liability of Vendor for all claims arising out of or relating to the performance or breach of the Contract or use of any Products or Services or any order shall not exceed the total Contract price.

25. Liability during guarantee / warranty: Vendor shall arrange replacement / repair of all the defective materials / services under its obligation under the guarantee / warranty period. The rejected goods shall be taken away by vendor and replaced / repaired. In the event of the vendor's failure to comply, BHEL may take appropriate action including disposal of rejections and replenishment by any other sources at the cost and risk of the vendor.
In case, defects attributable to vendor are detected during first time commissioning or use, vendor shall be responsible for replacement / repair of the goods as required by BHEL at vendor's cost. In all such cases expiry of guarantee / warranty will not be applicable.
26. Liability after guarantee / warranty period: At the end of the guarantee / warranty, the Vendor's liability ceases except for latent defects (latent defects are defects / performance issues notices after the guarantee / warranty has expired). The Contractor's liability for latent defects warranty for the plant and equipment including spares shall be limited to a period of six months from the end of the guarantee / warranty period of the respective plant and equipment including spares or first time commissioning whichever is later but not later than 3 (three) years from the date of shipment.
27. Compliance with Laws: Vendor shall, in performing the contract, comply with all applicable laws. The vendor shall make all remittances, give all notices, pay all taxes, duties and fees, and obtain all permits, licences and approvals, as required by the laws in relation to the execution and completion of the contract and for remedying of any defects; and the Contractor shall indemnify and hold BHEL harmless against and from the consequences of any failure to do so.
28. Settlement of Disputes: Except as otherwise specifically provided in the Purchase Order, decision of BHEL shall be binding on the vendor with respect to all questions relating to the interpretation or meaning of the terms and conditions and instructions herein before mentioned and as to the completion of supplies/work/services, other questions, claim, right, matter or things whatsoever in any way arising out of or relating to the contract, instructions, orders or these conditions or otherwise concerning the supply or the execution or failure to execute the order, whether arising during the schedule of supply/work or after the completion or abandonment thereof. Any disputes or differences among the parties shall to the extent possible be settled amicably between the parties thereto, failing which the disputed issues shall be settled through arbitration. Vendor shall continue to perform the contract, pending settlement of dispute(s).
29. Arbitration Clause: In case amicable settlement is not reached in the event of any dispute or difference arising out of the execution of the Contract or the respective rights and liabilities of the parties or in relation to interpretation of any provision in any manner touching upon the Contract, such dispute or difference shall (except as to any matters, the decision of which is specifically provided for therein) be referred by either party to the sole arbitration of an Arbitrator appointed by the Executive Director/ General Manager of the purchasing unit/ region/ division of BHEL. Vendor shall have no objection even if the Arbitrator so appointed is an employee of BHEL or has ever dealt/ had to deal with any matter relating to this Contract.
Subject as aforesaid the provisions of the Arbitration and Conciliation Act, 1996 of India or any statutory modification or re-enactment thereof and the rules made there under and for the time being in force shall apply to the arbitration proceedings under this clause. It is a term of contract that the party initiating arbitration shall specify the dispute or disputes to be referred to arbitration under this clause together with the amount or amounts claimed in respect of each such dispute. The venue for the arbitration shall be Bangalore, India. The award of the arbitrator shall be a speaking award and shall be final, conclusive and binding on all parties to this contract.
The cost of arbitration shall be borne equally by the parties. Notwithstanding the existence of any dispute or difference or any reference for the arbitration, the vendor shall proceed with and continue without hindrance the performance of the work under the contract with due diligence and expedition in a professional manner.
30. Applicable Laws and Jurisdiction of Courts: Prevailing Indian laws both substantive and procedural, including modifications thereto, shall govern the Contract. Subject to the conditions as aforesaid, the competent courts in BANGALORE alone shall have jurisdiction to consider over any matters touching upon this contract.

31. General Terms: That any non-exercise, forbearance or omission of any of the powers conferred on BHEL and /or any of its authorities will not in any manner constitute waiver of the conditions hereto contained in these presents.

That the headings used in this agreement are for convenience of reference only.

That all notices etc., to be given under the Purchase order shall be in writing, type script or printed and if sent by registered post or by courier service to the address given in this document shall be deemed to have been served on the date when in the ordinary course, they would have been delivered to the addressee.

ANNEXURE - I
LIST OF INTERNATIONAL GATEWAY AIRPORTS

For airbased consignment, terms of delivery will be on FCA basis from following listed airports only.
This list is valid from 01.03.2013 to 28.02.2015. Vendors are requested to verify this list for use after 28.02.2015.

SCHEDULE NO	COUNTRY	CURRENCY CODE	AIRPORT
D01	UK	GBP	LONDON (HEATHROW)
D02	UK	GBP	NEW CASTLE
D03	UK	GBP	OXFORD. CHETLAM
D04	UK	GBP	BRISTOL. WELLINGBOROUGH
D05	UK	GBP	BIRMINGHAM
D06	UK	GBP	EAST MIDLANDS
D07	UK	GBP	MANCHESTER
D08	UK	GBP	LEEDS
D09	UK	GBP	GLASGOW
D10	FRANCE	EURO	PARIS (ROISSY) & LYON
D11	SWEDEN	EURO	STOCKHOLM
D12	SWEDEN	EURO	GOTHENBERG & MALMO
D13	ITALY	EURO	ROMA, MILAN
D14	ITALY	EURO	TURIN, BOLOGNA, FLORENCE
D15	NETHERLANDS	EURO	AMSTERDAM, ROTTERDAM
D16	AUSTRIA	EURO	VIENNA, LINZ, GRAZ
D17	BELGIUM	EURO	ANTWERP, BRUSSELS
D18	DENMARK	DKK	COPENHAGEN
D19	JAPAN	JPY	TOKYO, OSAKA
D20	SINGAPORE	SGD	SINGAPORE
D21	CANADA	CAD	TORONTO
D22	CANADA	CAD	MONTREAL
D23	USA	USD	NEW YORK, BOSTON
D24	USA	USD	CHICAGO
D25	USA	USD	SAN FRANCISCO, LOS ANGELES
D26	USA	USD	ALANTA, HOUSTON
D27	GERMANY	EURO	MUNICH, KOLN, DUSSELDORF, HANNOVER, HAMBURG, STUTTGART, DAMSTADT, MANIHIEM, NURUMBERG
D28	GERMANY	EURO	FRANKFURT
D29	GERMANY	EURO	BERLIN
D30	SWITZERLAND	SFR	BASLE, ZURICH, GENEVA
D31	SPAIN	EURO	BARCELONA
D32	AUSTRALIA	AUD	SYDNEY
D33	AUSTRALIA	AUD	MELBOURNE
D34	AUSTRALIA	AUD	PERTH
D35	CZECH	EURO	PRAGUE
D36	HONG KONG	HKD	HONG KONG
D37	NEW ZELAND	NZD	AUCKLAND
D38	RUSSIA	USD	MOSCOW
D39	SOUTH KOREA	USD	KIMPO INTERNATIONAL, INCHEON
D40	FINLAND	EURO	HELSINKI
D41	ROMANIA	EURO	BUCHAREST
D42	NORWAY	EURO	OSLO
D43	IRELAND	EURO	DUBLIN
D44	ISRAEL	USD	TEL AVIV
D45	UAE	USD	DUBAI
D46	OMAN	USD	MUSCAT
D47	EGYPT	USD	CAIRO
D48	TAIWAN	USD	TAIPEI
D49	UKRAINE	USD	KIEV
D50	CHINA	USD	SHANGHAI, SHENZHEN
D51	PHILIPINES	USD	MANILA
D52	MALAYSIA	USD	KUALALUMPUR, PE NANG
D53	CYPRUS	USD	LARNACA
D54	SOUTH AFRICA	USD	JOHANNESBERG, DURBAN
D55	SLOVAKIA	EURO	BARTISLOVA
D56	SAUDI ARABIA	SAR	RIYADH
D57	TURKEY	EURO	ISTANBUL
D58	THAILAND	USD	BANGKOK
D59	BRAZIL	USD	SAO PAULO, RIO DE JANEIRO

ANNEXURE – II
DISCREPANCY IN WORDS & FIGURES – QUOTED IN PRICE BID

Following guidelines will be followed in case of discrepancy in words & figures-quoted in price bid:

(a) If, in the price structure quoted for the required goods/services/works, there is discrepancy between the unit price and the total price (which is obtained by multiplying the unit price by the quantity), the unit price shall prevail and the total price corrected accordingly, unless in the opinion of the purchaser there is an obvious misplacement of the decimal point in the unit price, in which case the total price as quoted shall govern and the unit price corrected accordingly.

(b) If there is an error in a total corresponding to the addition or subtraction of subtotals, the subtotals shall prevail and the total shall be corrected; and

(c) If there is a discrepancy between words and figures, the amount in words shall prevail, unless the amount expressed in words is related to an arithmetic error, in which case the amount in figures shall prevail subject to (a) and (b) above.

(d) If there is such discrepancy in an offer, the same shall be conveyed to the bidder with target date upto which the bidder has to send his acceptance on the above lines and if the bidder does not agree to the decision of the purchaser, the bid is liable to be ignored.

ANNEXURE-III
GUIDELINES FOR REVERSE AUCTION PROCEDURE

Against this enquiry for the subject item/ system with detailed scope of supply as per enquiry specifications, BHEL may resort to "REVERSE AUCTION PROCEDURE" i.e., ON LINE BIDDING (THROUGH A SERVICE PROVIDER). The philosophy followed for reverse auction shall be English Reverse (No ties).

1. For the proposed reverse auction, technically and commercially acceptable bidders only shall be eligible to participate.
2. Those bidders who have given their acceptance for Reverse Auction (quoted against this tender enquiry) will have to necessarily submit "online sealed bid" in the Reverse Auction. Non-submission of "online sealed bid" by the bidder for any of the eligible items for which techno-commercially qualified, will be considered as tampering of the tender process and will invite action by BHEL as per extant guidelines in vogue.
3. BHEL will engage the services of a service provider who will provide all necessary training and assistance before commencement of on line bidding on internet.
4. In case of reverse auction, BHEL will inform the bidders the details of Service Provider to enable them to contact & get trained.
5. Business rules like event date, time, bid decrement, extension etc. also will be communicated through service provider for compliance.
6. Bidders have to fax the Compliance form before start of Reverse auction. Without this, the bidder will not be eligible to participate in the event.
7. In line with the NIT terms, BHEL will provide the calculation sheet (e.g., EXCEL sheet) which will help to arrive at "Total Cost to BHEL" like Packing & forwarding charges, Taxes and Duties, Freight charges, Insurance, Service Tax for Services and loading factors (for non-compliance to BHEL standard Commercial terms & conditions) for each of the bidder to enable them to fill-in the price and keep it ready for keying in during the Auction.
8. Reverse auction will be conducted on scheduled date & time.
9. At the end of Reverse Auction event, the lowest bidder value will be known on auction portal.
10. The lowest bidder has to fax/e-mail the duly signed and filled-in prescribed format for price breakup including that of line items, if required, as provided on case-to-case basis to Service provider within two working days of Auction without fail.
11. In case BHEL decides not to go for Reverse Auction procedure for this tender enquiry, the Price bids and price impacts, if any, already submitted and available with BHEL shall be opened as per BHEL's standard practice.
12. Bidders shall be required to read the "Terms and Conditions" section of the auctions site of Service provider, using the Login IDs and passwords given to them by the service provider before reverse auction event. Bidders should acquaint themselves of the "Business Rules of Reverse Auction", which will be communicated before the Reverse Auction.
13. If the Bidder or any of his representatives are found to be involved in Price manipulation/ cartel formation of any kind, directly or indirectly by communicating with other bidders, action as per extant BHEL guidelines, shall be initiated by BHEL and the results of the RA scrapped/ aborted.
14. The Bidder shall not divulge either his Bids or any other exclusive details of BHEL to any other party.
15. In case BHEL decides to go for reverse auction, the H1 bidder (whose quote is highest in online sealed bid) may not be allowed to participate in further RA process.

ANNEXURE - IV
Electronic Funds Transfer (EFT) OR
Paylink Direct Credit Form

Please Fill up the form in **CAPITAL LETTERS** only.

TYPE OF REQUEST(Tick one): _____ CREATE _____ CHANGE

BHEL Vendor / Supplier Code:	
Company Name :	
Permanent Account Number(PAN):	
Address	

City:	PINCODE		STATE	
-------	---------	--	-------	--

Contact Person(s)	
Telephone No:	
Fax No:	
e-mail id:	

1 Bank Name:	
2 Bank Address:	
3 Bank Telephone No:	
4 Bank Account No:	
5 Account Type: Savings/Cash Credit	
6 9 Digit Code Number of Bank and branch appearing on MICR cheque issued by Bank	
7 Bank IFSC Code(applicable for NEFT)	
8 Bank IFSC code(applicable for RTGS)	

(Indian Financial System Code)

- A I hereby certify that the particulars given above are true, correct and complete and that I, as a representative for the above named Company, hereby authorise BHEL, EDN, Bangalore to electronically deposit payments to the designated bank account.
- B If the transaction is delayed or not effected at all for reasons of incomplete or incorrect information, I would not hold BHEL / transferring Bank responsible.
- C This authority remains in full force until BHEL, EDN, Bangalore receives written notification requesting a change or cancellation.
- D I have read the contents of the covering letter and agree to discharge the responsibility expected of me as a participant under ECS / EFT.

Date:

Authorised Signatory:
 Designation:

Telephone No. with STD Code

Company Seal

Bank Certificate

We certify that _____ has an Account No _____ with us and we confirm that the bank details given above are correct as per our records.

Date: _____ (.....)
 Place: _____ Signature

Please return completed form **along with a blank cancelled cheque or photocopy** thereof to:

Bharath Heavy Electricals Ltd,

Attn:

Electronics Division, Mysore Road,
 BANGALORE - 560 026

In case of any Query, please call concerned purchase executive.

ANNEXURE - V
PRESENT PROCEDURE FOR SALE IN TRANSIT (HIGH SEA SALES)

In case of High Sea Sales, vendor should submit following documents:

1. ORIGINAL HIGH SEA SALES AGREEMENT

- Sale agreement (on Rs. 200/- non-judicial stamp paper & notarised with 2 witnesses with identity) has to be signed between BHEL and the Party importing material. The date of the sale documents should be in between the date of House Air Way Bill / Bill of Lading and before landing of the goods in Indian origin.
- The date of the stamp paper should be prior to the Air Way Bill / Bill of Lading date.
- Following shall be included in the High Sea Sales Agreement:
“THE BUYER ALSO UNDERTAKE DISCHARGES, THE OBLIGATION AND FULFILLMENT OF CONDITIONS, IF ANY, ATTACHED TO THE IMPORTATION, ASSESSMENT AND CLEARANCE OF THE GOODS IN TERMS CUSTOMS TARIFF ACT 1975, THE CUSTOMS ACT 1962 & RULES & REGULATIONS MADE THERE UNDER AND OTHER RELEVANT ACTS, ORDERS, NOTIFICATIONS”.

2. ORIGINAL INVOICES: INDIGENOUS RUPEE INVOICE & FOREIGN CURRENCY INVOICE

- Prices should be C.I.F., designated airport/seaport basis.
- I.E.C., C.S.T., K.S.T. Nos. to be mentioned.
- Description of item (Nomenclature), Unit & Quantity in both the Foreign Currency & the Indigenous Invoice in Rupee shall be exactly as per Purchase Order Description of item, Quantity and Unit. The Indigenous Invoice value shall be exactly as per Purchase Order value.
- Seller should give Foreign Currency Invoice from the original consignor. The Foreign Currency Invoice value should be at least 2% (two per cent) less than the Indigenous Rupee Invoice value in equivalent foreign currency.

4. ORIGINAL HOUSE AIR WAY BILL/ BILL OF LADING

- The sale agents should duly endorse House Air Way Bill (HAWB) for air shipments or original Bill of Lading (O.B.L.) for sea shipments and Foreign Currency Invoice in favour of BHEL-EDN.

5. ORIGINAL CARGO ARRIVAL NOTICE FROM FORWARDER.

6. ORIGINAL DELIVERY ORDER ISSUED IN NAME OF BHEL-EDN.

7. ORIGINAL PACKING LIST.

8. A LETTER TO THE COMMISSIONER OF CUSTOMS FOR EFFECTING ABOVE SALE.

9. A LETTER TO THE DEPUTY ASSESSOR (OCTROI) FOR EFFECTING ABOVE SALE IN FAVOUR OF BHEL.

REMARKS: In case vendor needs any clarifications on the above, the same may be sought in writing.

Annexure-VI
BHEL MEMBER BANKS (LIST OF CONSORTIUM BANKS)

BANK GUARANTEE (BG) SHALL BE ISSUED FROM THE FOLLOWING BANKS ONLY:

	Nationalised Banks		Nationalised Banks
1	Allahabad Bank	19	Vijaya Bank
2	Andhra Bank		Public Sector Banks
3	Bank of Baroda	20	IDBI
4	Canara Bank		Foreign Banks
5	Corporation Bank	21	CITI Bank N.A
6	Central Bank	22	Deutsche Bank AG
7	Indian Bank	23	The Hongkong and Shanghai Banking Corporation Ltd. (HSBC)
8	Indian Overseas Bank	24	Standard Chartered Bank
9	Oriental Bank of Commerce	25	The Royal Bank of Scotland N.V.
10	Punjab National Bank	26	J P Morgan
11	Punjab & Sindh Bank		Private Banks
12	State Bank of India	27	Axis Bank
13	State Bank of Hyderabad	28	The Federal Bank Limited
14	Syndicate Bank	29	HDFC Bank
15	State Bank of Travancore	30	Kotak Mahindra Bank Ltd
16	UCO Bank	31	ICICI Bank
17	Union Bank of India	32	IndusInd Bank
18	United Bank of India	33	Yes Bank

Note:

- All BGs must be issued from BHEL consortium banks listed above.
- BHEL may accept BG from other Nationalised Banks also which are not listed above.
- BG will not be accepted from Scheduled Banks and Co-operative Banks.
- In case BG is issued from a bank located outside Indian territory and is issued in foreign currency, the BG must be routed through and confirmed by any one of the above mentioned consortium banks or any of the Indian Public Sector Banks.
- This list is subject to changes. Hence vendors are requested to check this list every time before issuing BGs.

ANNEXURE-VII
PROFORMA OF PERFORMANCE BANK GUARANTEE
(For Bank Guarantees issued in Indian Rupees by Banks in India)

Note:

- To be executed in Rs. 100/- Non-Judicial stamp paper.
- To be submitted by issuing bank to Purchase Dept. directly. Please give BHEL address to banker.
- Do not enclose with Bank document.
- Modifications and additions/deletions to this BG format are not permitted.

PERFORMANCE GUARANTEE (PROFORMA OF BANK GUARANTEE)

Ref no: (BG No.) _____

THIS DEED OF GUARANTEE made and executed on the _____ day of _____ (month & year), by the _____ (Bank), registered under the Companies Act 1956/Nationalised Bank constituted under the Banking Companies (acquisition and transfer of undertakings) Act constituted under the **State Bank of India Act / Subsidiary Banks Act**, having its registered / head office at _____ represented herein by its Branch Manager / authorised representatives Sri. _____ & Sri. _____ (Hereinafter called 'guarantor' which term shall mean and include its successors and assigns)

IN FAVOUR OF BHARAT HEAVY ELECTRICALS LIMITED

_____ (Buyer's Name), a company registered under the companies Act, 1956 having its registered office at BHEL House at Siri Fort, New Delhi-110 049 and its Electronics Division at Mysore Road, Bangalore - 26 (hereinafter referred to as the 'Company' Which term shall include its successors and assigns):

Whereas the company has placed an order on _____ (State the name of the company / firm and its address) (hereinafter referred to as the 'Supplier' which term shall mean and include its liquidators, successors and assign) for the supply of system under order / Contract No _____ Dtd _____.

AND WHEREAS the supplier has agreed to supply the materials and carryout the works as detailed and in accordance with the terms set out in the said order / contract.

AND WHEREAS the company is not required to pay to the supplier a sum of Rupees _____ being the 10% of the value of the goods supplied / Works performed / Services rendered under the said order / contract between the supplier and the company, till the company is satisfied with the mechanical Warranties and the performance standards stipulated in the said order / contract between the company and the supplier has been duly fulfilled, except, against a Bank Guarantee for the said sum of Rs. _____ in favour of the company by reputed Bank, in which case the company has agreed to make payment to the supplier of the said sum of Rupees _____ being (10%) of the value of the goods supplied / Works performed / Services rendered under the agreement between the supplier and the company and the Guarantor has at the request of the supplier, agreed to furnish this Guarantee subject to the terms and conditions stated below :

NOW THIS DEED WITNESSES THAT IN pursuance of the above said agreement, the guarantor hereby agrees and covenants with company is as follows:

- 1) That during the period this contract of Guarantee remains effectual, the guarantor shall be liable in respect of the amount due and owing to the company in respect of the payments to the extent of Rs _____ (in words) _____ against any loss or damage caused to or suffered by the company by reasons of any breach of the terms of the said order / contract / Agreement by the supplier
- 2) The Guarantor hereby undertakes to pay the amounts and payable under this guarantee without any demur, merely on demand from the company intimating that the amount claimed is due by way of loss or damage caused to or suffered or would be caused or suffered by any terms contained in the said order/contract. Any such demand made on the guarantor shall be conclusive as regards the amount due and payable by the Guarantor irrespective of the fact whether the contractor/supplier admits or denies.
- 3) The Guarantor further agrees that the agreement herein contained shall remain in force and effect till all supplies to be made /works to be performed / services to be rendered under the said order /contract /agreement are completed to the entire satisfaction of the company or till company certifies that the terms and conditions of the said order / contract agreement have been fully and

properly carried out by the said supplier and accordingly discharges the Guarantee. Unless a demand or claim under this guarantee is made on the guarantor in writing on or before the expiry of claim period indicated in clause 6 below, the guarantor shall be discharged from all the liability under this guarantee thereafter.

- 4) The guarantor further agrees with the company that the company shall have the fullest liberty without the consent of the guarantor and without effecting in any manner the obligations of the guarantor hereunder to vary any of the terms of the said order / contract / agreement or extend the time of performance by the said supplier from time to time or refrain from exercising the power exercisable by the company against the said supplier or to forebear or omit to enforce any of the terms and conditions relating to the said order / contract / agreement, and the guarantor shall not be relieved of its liability in whole or in part, by reason of any act, commission or forbearance on the part of the company or by reason of any such variation, or extension being granted to the said supplier or by reason of any such matter or thing whatsoever which under the law relating to sureties would but for this provision have effect of so relieving the guarantor.
- 5) The guarantor undertakes not to revoke this guarantee during its currency except with the previous consent of the company in writing.
- 6) Notwithstanding anything herein above obtained, the liability of the guarantor under these presents is restricted to Rs._____. The guarantee shall be in force till its expiry on _____ unless a demand is made on the guarantor within SIX months from the date of expiry, all the liability of the guarantor under this guarantee shall stand fully discharged. The decision of the claimant in regard to breach of contract is final and binding on the Bank.

IN WITNESS whereof, the guarantor, acting through its authorised representative has executed this deed of Guarantee on the day, month and year first above written.

(Seal of the Bank to be affixed)
For & On behalf of _____ Bank
Signature of authorized person with
seal & designation

WITNESS:

1.

2.

ANNEXURE-VIII
PROFORMA OF PERFORMANCE BANK GUARANTEE
(For Bank Guarantees issued in Foreign Currency by Banks located outside India)

BANK NAME AND ADDRESS

Electronics Division
Bharat Heavy Electrical Limited (B.H.E.L.),
Mysore Road, P.B. No. 2606,
Bangalore- 560 026

Dear Sir,

Sub : CONTRACT PERFORMANCE GUARANTEE Ref no. Dtd.....

WHEREAS you have entered into a contract reference No & PO NO. _____
Date _____ with M/s _____ having its registered office at
_____ for the supply of _____ as detailed in your purchase
order No. _____ which is hereinafter referred to as "the said contract" and WHEREAS M/s
_____ has undertaken to produce a Bank Guarantee for 10% (Ten Percent)
of the contract price amounting to _____
(_____) to secure its obligations to Electronics Division, BHEL
having its registered office at New Delhi for the performance of the contract including the warranty of the
equipment supplied, We _____ Bank,
_____ hereby expressly, irrevocably and unreservedly undertake and
guarantee as principal obligors on behalf of M/s _____ that in the event Bharat
Heavy Electricals Ltd. (B.H.E.L.) declares to us in writing that M/s _____
has not fulfilled any obligors according to the contractual obligation of the said contract, to pay you on
demand and without demur to Bharat Heavy Electricals Ltd., Electronics Division, Mysore Road, P.B.No.
2606, Bangalore - 560 026., India an amount of _____
(in words _____) subject to
as may be determined below :

1. Notwithstanding any right M/s. _____ may have directly against or any
disputes raised by M/s. _____, Your written demand shall be conclusive
evidence to us that repayment is due under the terms of the said contract and shall be binding on
us.

2. We shall not be discharged or released from this undertaking and Guarantee by any arrangements, variations made between you and M/s. _____ with or without our consent and knowledge or by any alteration in the obligations of M/s. _____ by any forbearance whether as to payment, time, performance or otherwise.
3. This guarantee shall remain valid until the end of six months after the close of the warranty period or until the same is reported by BHEL to us whichever is earlier.
4. We agree and undertake not to revoke this guarantee during its validity unless discharged in writing by you subject to the provision of clause (7) below :
5. This guarantee shall be a continuing guarantee subject to the foregoing and shall not be discharged by any change in the constitution of the Bank or M/s. _____ .
6. This guarantee shall be governed by and constructed in accordance with the Laws of India.
7. At any time _____ Bank may render this guarantee null and void by paying to Bharat Heavy Electricals Ltd. the full amount being _____ (in words _____)
_____)

**For and On behalf of Bank
By its Authorised Signatory**

Annexure - IX
Certificate by Chartered Accountant on Letter Head

This is to certify that M/s
.....(Hereinafter referred to as `Company')
having its registered office at is registered under MSMED Act 2006,
(Entrepreneur Memorandum No (Part-II dtd
Category: (Micro/Small). (Copy enclosed).

Further verified from the Books of Accounts that the investment of the company as
on date..... **as per MSMED Act 2006 is as follows:**

- 1. For Manufacturing Enterprises:** Investment in plant and machinery (i.e., original cost excluding land and building and the items specified by the Ministry of Small Industries vide its notification No.S.O.1722 (E) dated October 5, 2006:
- 2. For Service Enterprises:** Investment in equipment (original cost excluding land and building and furniture, fittings and other items not directly related to the service rendered or as may be notified under the MSMED Act, 2006:
Rs.Lacs.

The above investment of Rs. Lacs in within permissible limit of
Rs..... Lacs for.....Micro / Small (Strike off which is not
applicable) Category under MSMED Act 2006.

Date:

(Signature)

Name -
Membership Number -
Seal of Chartered Accountant

Guidelines for Indian Agents
ANNEXURE - X

- Definition of Indian Agent: An Indian Agent of foreign principal is an individual, a partnership, an association of persons, a private or public company, that carries out specific obligation(s) towards processing of BHEL tender or finalization or execution of BHEL's contract on behalf of the foreign supplier.

In case of yes, vendor to note the following and reply accordingly:

- i. BHEL shall deal directly with foreign vendors, wherever required, for procurement of goods. However, if the foreign principal desires to avail of the services of an Indian agent, then the foreign principal should ensure compliance to regulatory guidelines - which require mandatory submission of an Agency Agreement.
- ii. It shall be incumbent on the Indian agent and the foreign principal to adhere to the relevant guidelines of Government of India, issued from time to time.
- iii. The Agency Agreement should specify the precise relationship between the foreign OEM / foreign principal and their Indian agent and their mutual interest in the business. All services to be rendered by agent/ associate, whether of general nature or in relation to the particular contract, must be clearly stated by the foreign supplier/ Indian agent. Any payment, which the agent or associate receives in India or abroad from the OEM, whether as commission or as a general retainer fee should be brought on record in the Agreement and be made explicit in order to ensure compliance to laws of the country.
- iv. Any agency commission to be paid by BHEL to the Indian agent shall be in Indian currency only.
- v. Tax deduction at source is applicable to the agency commission paid to the Indian agent as per the prevailing rules.
- vi. In the absence of any agency agreement, BHEL shall not deal with any Indian agent (authorized representatives / associate / consultant, or by whatever name called) and shall deal directly with the foreign principal only for all correspondence and business purposes.
- vii. The "Guidelines for Indian Agents of Foreign Suppliers" enclosed at annexure -'A' shall apply in all such cases.

- viii. The supply and execution of the Purchase Order (including indigenous supplies/ service) shall be in the scope of the OEM/ foreign principal. The OEM/ foreign principal should submit their offer inclusive of all indigenous supplies/ services and evaluation will be based on 'total cost to BHEL'. In case OEM/ foreign principal recommends placement of order(s) towards indigenous portion of supplies/ services on Indian supplier(s)/ agent on their behalf, the credentials/ capacity/ capability of the Indian supplier(s)/ agent to make the supplies/ services shall be checked by BHEL as per the extant guidelines of Supplier Evaluation, Approval & Review Procedure (SEARP), before opening of price bids. In this regard, details may be checked as per Annexure-B (copy enclosed). It will be the responsibility of the OEM/ foreign principal to get acquainted with the evaluation requirements of Indian supplier/ agent as per SEARP available on www.bhel.com.

The responsibility for successful execution of the contract (including indigenous supplies/ services) lies with the OEM/ foreign principal. All bank guarantees to this effect shall be in the scope of the OEM/ foreign principal.

--X--

Vendor's Signature with Seal

Guidelines for Indian Agents of Foreign Suppliers

- 1.0 There shall be compulsory registration of agents for all Global (Open) Tender and Limited Tender. An agent who is not registered with DIICL shall apply for registration in the registration form in line with SEARP.
- 1.1 Registered agents will file an authenticated Photostat copy duly attested by a Notary Public/Original certificate of the Principal confirming the agency agreement and giving the status being enjoyed by the agent and the commission/ remuneration/ salary/ retainership being paid by the principal to the agent before the placement of order by BHEL.
- 1.2 Wherever the Indian representatives have communicated on behalf of their principals and the foreign parties have stated that they are not paying any commission to the Indian agents, and the Indian representative is working on the basis of salary or as retainer, a written declaration to this effect should be submitted by the party (i.e. Principal) before finalizing the order.
- 2.0 Disclosure of particulars of agents/ representatives in India, if any.**
- 2.1 Tenderers of Foreign nationality shall furnish the following details in their offers:
- 2.1.1 The Bidder(s)/ Contractor(s) of foreign origin shall disclose the name and address of the agents/ representatives in India if any and the extent of authorization and authority given to commit the Principals. In case the agent/ representative be a foreign Company, it shall be confirmed whether it is existing Company and details of the same shall be furnished.
- 2.1.2 The amount of commission/ remuneration included in the quoted price(s) for such agents/ representatives in India.
- 2.1.3 Confirmation of the Tenderer that the commission/ remuneration, if any, payable to his agents/ representatives in India, may be paid by BHEL in Indian Rupees only.
- 2.2 Tenderers of Indian Nationality shall furnish the following details in their offers:
- 2.2.1 The Bidder(s)/ Contractor(s) of Indian Nationality shall furnish the name and address of the foreign principals, if any, indicating their nationality as well as their status, i.e. whether manufacturer or agents of manufacturer holding the Letter of Authority of the Principal specifically authorizing the agent to make an offer in India in response to tender either directly or through the agents/ representatives.
- 2.2.2 The amount of commission/ remuneration included in the price (s) quoted by the Tenderer for himself.
- 2.2.3 Confirmation of the foreign principals of the Tenderer that the commission/ remuneration, if any, received for the Tenderer in the quoted price(s), may be paid by BHEL in India in equivalent Indian Rupees on satisfactory completion of the Project or supplies of Stores and Spares in case of operation items.
- 2.3 In either case, in the event of contract materializing, the terms of payment will provide for payment of the commission/ remuneration, if any payable to the agents/ representatives in India in Indian Rupees on expiry of 90 days after the discharge of the obligations under the contract.
- 2.4 Failure to furnish correct and detailed information as called for in paragraph 2.0 above will render the concerned tender liable to rejection or in the event of a contract materializing, the same liable to termination by BHEL. Besides this there would be a penalty of banning business dealings with BHEL or damage or payment of a named sum.

Disclaimer Certificate For Deemed Export Benefits

I, (Name & Designation)on behalf of M/s. (Name and address of the supplier) hereby certify that we have supplied the following goods to M/s..... (Name and address of the recipient):

S.No.	Inv. No. & date	Description of goods	Unit	Qty.	Value

1. We are the manufacturer exporters/suppliers and are registered/not registered with Central Excise and have not availed and will not avail CENVAT facility in respect of the input/components used in aforesaid supplies. We have also not availed and will not avail rebate on the inputs/components used in aforesaid supplies.

OR

We are the suppliers and our supporting manufacturer(s) is/are registered/not registered with Central Excise and have not availed and will not avail CENVAT facility in respect of the inputs/components used in aforesaid supplies.

2. We also certify that we have not been issued any Advance Authorization/Duty Free Import Authorization in respect of the aforesaid supplied goods and have not availed any benefit thereon.

3. We further state that we have not drawn nor will draw any benefit for deemed export and we have no objection if M/s..... (Name and address of the recipient) draws the deemed export benefits on the supplies mentioned above. (Required to be given in case benefits are claimed by recipient of goods).

OR

We have not given disclaimer certificate to M/s..... (Name and address of the recipient) and will not give disclaimer certificate, in future, in respect of these supplies for claiming deemed export benefits (Required to be given in case benefits are claimed by DTA suppliers).