

**Government of India
Bhabha Atomic Research Centre, Mysuru
Proj. SMF Challakere, Chitradurga**

Ref.: BARC/SMFC/FMF/2024/LTSS/NIT/C-1

20.01.2026

Name of the Tender: Composite work of SITC of Electrical Systems and Design & Construction of civil works in Substations at SMFC, BARC, Challakere, Karnataka for:

- A. SITC of 2 X 2.5 MVA, 11/0.433 kV LT substation with HT & LT Panels; HT & LT Cables; 2 Nos. of 750 kVA, 0.433 kV DG including design & construction of civil structures for new Substation building-1, cable trenches, finishing works and associated electrical works.
- B. SITC of 2 X 2.5 MVA, 11/0.433 kV LT substation with HT & LT Panels; HT & LT Cables; including construction of balance civil works in an existing Substation building-2, cable trenches, finishing works and associated electrical works”

Tender No.: BARC/SMFC/FMF/2024/LTSS/NIT; dt.: 23-12-2025

CPP Portal Tender ID.: 2025_BARC_891245_1

Corrigendum-1

1. With reference to the above tender, all bidders are requested to note the following new clauses and amendments to the tender documents

a. New Clauses:

Section, Clause no.	Additional Clause(s) added in the Tender Document
Section-I- NIT, Clause- VI.44	44. E-Bank Guarantee (e-BG) is also acceptable and preferred wherever BG is applicable. Details are “Pay and Accounts Officer, BARC, Mysore”. The beneficiary bank name and address are: State Bank of India, Main Branch, Mysuru, IFSC SBIN0003130
Section-I- NIT, Clause- VI.45	45. The contractor shall obtain Contractor’s All Risk Policy (CAR) policy for the contract value, valid for the contract period including extensions if any, from a nationalized insurance company.
Section-I- NIT, Clause- VI.46	46. The successful bidder/contractor shall maintain the status of the lowest bidder, i.e., L1 bidder during the entire contract period. The successful bidder/contractor shall have to operate all Schedule of Quantity items including low rated items (if any) in order to maintain the L1 status at the time of completion/ closure of the awarded work. In case the L1 status is not maintained, the contractor shall have to deposit the differential amount to the department in order to maintain the lowest bidder status. On non-compliance on the part of the contractor, the Department reserves the right to deduct such differential amount from the receivables of the contractor

	from the subject work or any other works(s) under the Govt. of India /Public Sector Undertaking /State Govt./Local bodies.
Section-IV- Special Instructions to Tenderers- Clause-44A	Annexure-I: Security Regulations to be followed by the Contractor

b. Amendments to Existing Clauses:

Section, Clause no. Page no.	Clause mentioned in the Tender Document	Amended Clause to be replaced in place of referred Original Clause in the Tender Document
Section-I-NIT, Clause- V.29.vii); Page no. 18	Bidder should be registered under EPF & ESIC as per law. Bidder shall pay EPF & ESIC of contract workers to concerned Department and it will be reimbursed to him by BARC after satisfying that it has been genuinely paid by the bidder based on documentary evidence. The bidder shall not consider EPF & ESIC in his rates. Bidder shall comply provisions of the EPF Act, 1952 in respect of all the eligible employees / workers/ labours and submit the documentary proof regularly with every RA Bill.	Bidder should be registered under EPF and as per law. Bidder shall pay EPF of contract workers to concerned Department and it will be reimbursed to him by BARC after satisfying that it has been genuinely paid by the bidder based on documentary evidence. The bidder shall not consider EPF in his rates. Bidder shall comply provisions of the EPF Act, 1952 in respect of all the eligible employees / workers/ labours and submit the documentary proof regularly with every RA Bill. Bidder should ensure that all their employees /workers/ labours (working at BARC premises) should be covered either under Employees Compensation Insurance Policy/ Group Insurance/ Personal Insurance Policy or ESIC. In case of ESIC, bidder should be registered under ESIC and as per law. Bidder shall pay ESIC of contract workers to concerned Department and it will be reimbursed to him by BARC after satisfying that it has been genuinely paid by the bidder based on documentary evidence. The bidder shall not consider ESIC in his rates. Amount towards Employees Compensation Insurance Policy/ Group Insurance/ Personal Insurance Policy will not be reimbursed.

2. Revised Tender bid end date & timings are as follows:

Sl.NO	Tender activity	Existing Date and time as per corregendum-1	Revised Date and time
1	Bid Submission End Date & End Date of Download of Bid Documents	02-02-2026, 16:00:00	09-02-2026, 16:00:00
2	Submission of EMD in physical form	09-02-2026, 14:00:00	13-02-2026, 14:00:00
3	Bid opening Date /Date and time of online opening of Cover-1	09-02-2026, 15:00:00	13-02-2026, 15:00:00

3. Pre-bid clarifications are enclosed (as Annexure-II) and shall form a part of the tender document. It shall be deemed that all bidders who submit their bids have read and accepted the pre-bid clarifications.

4. All other tender conditions remain unchanged.

Encl.: 1) Annexure-I: Security Regulations to be followed by the Contractor
2) Annexure-II: Pre-Bid Clarifications
3) Appendix 'A': Format of Bid Security (Bank Guarantee) for EMD

Sd/-
Chief Engineer, BARC, Mysuru
For and on behalf of President of India

Annexure-I

Security Regulations to be followed by the Contractor

1. The security regulations to be followed by the Contractor are briefly mentioned in Clause-44, Clause-47, and Clause-48 of the Special Instructions to Tenderers of Section-IV of the Tender Document. These regulations are further elaborated below and shall supersede the provisions of Clause-44, Clause-47, and Clause-48 in case of any conflict.
2. The Contractor shall submit details of any sub-contract awarded by them, including the period of work and complete particulars of the sub-contractor's staff/labourers (Name, Designation, Father's Name, Aadhaar Number, and Contact Number), to the Security Officer through EIC, SMFC, on the Contractor's letterhead.
3. The Contractor and sub-contractor must submit details of their staff/labourers in the prescribed format, along with all required enclosures, to the Security Officer through EIC, SMFC.
4. Police Verification Certificate (PVC) is mandatory for all Contractor's and sub-contractor's staff/labourers, including in-camp labourers, engaged in any type of contract work at the SMFC project site. The PVC shall be valid for three (3) years from the date of issue, unless any adverse report is received against the concerned worker or as per guidelines issued by DAE.
5. Every year in the month of January, the Contractor shall submit an undertaking to the Security Officer through EIC, SMFC, affirming non-involvement of their staff/labourers in any criminal activity and/or police case. The undertaking shall be duly signed by the Contractor. In case the declaration is found to be false, the Contractor shall be held fully responsible.
6. A temporary photo identity card shall be issued by the Security Section of SMFC, to the staff /labourers of the contractor /sub-contractor who have submitted their PVC.
7. The Contractor may apply for a 15-day temporary entry permit for non-PVC staff/labourers in the prescribed form, duly supported by a copy of the Aadhaar Card, to the Security Officer through EIC, SMFC. Such permit may be renewed at intervals of 15 days for a maximum period of 45 days, during which submission of the Police Verification Certificate (PVC) shall be ensured by the Contractor.

8. The Contractor/Sub-contractor shall deploy a supervisor to assist Security and EIC, SMFC, in matters related to entry/exit of labourers and movement of Contractor's materials and vehicles. The supervisor shall also be responsible for overseeing the activities of labourers at the work site during working hours as well as beyond normal working hours.
9. The Contractor shall be permitted to work on Saturdays, Sundays, Government holidays, and beyond normal working hours only after giving prior intimation to the Security Officer through EIC, SMFC, in the prescribed form. Such work shall be supervised by a nominated and responsible departmental employee.
10. Carrying of mobile phones inside the project site is restricted and subject to approval by the competent authority. Supervisors of the Contractor/Sub-contractor may be permitted to carry mobile phones after submission of an undertaking (in the prescribed format) by the main Contractor to the Security Officer, which shall be approved by PM/DPM, SMFC. Mobile phones for Contractor labourers may be permitted depending upon the nature of work and submission of an undertaking by the Contractor, subject to approval by PM/DPM, SMFC. Such approval shall be valid for one month from the date of issue.
11. The Contractor shall be permitted to set up a labour camp inside the SMFC project site, subject to compliance with the following conditions
 - a) The contractors shall barricade the labour colony with a 3-meter-high GI sheet providing sufficient illumination around the periphery and have single entry/exit gate. Basic amenities should be provided within the labour colony.
 - b) Contractor's shall deploy a supervisor at all time in the labour colony to assist the department security related issue.
 - c) The contractor shall provide round-the-clock security, with one Security personnel assigned for each 8-hour shift.
 - a) Liquor and smoking will be strictly prohibited at labour colony and construction site. Contractors shall submit an undertaking to ensure the same.
 - b) Mobile phones may be permitted for Contractor personnel and labourers inside the labour colony. However, use of mobile phones at the construction site shall be restricted and permitted only with approval from the competent authority.
 - c) Family members of labourers shall be permitted to stay inside the labour camp subject to production of valid identity documents such as Aadhaar Card,

Ration Card, etc. Requirements regarding PVC for family members shall be intimated separately in due course.

12. Contractors shall be permitted to bring vehicles such as trucks, JCBs, tractors, tippers, Hitachi machines, etc., for execution of the work, after submitting a written request in the prescribed form to the Security Officer through EIC, SMFC. Copies of valid Driving Licence, Registration Certificate (RC), Insurance, and other relevant documents shall be enclosed. Parking of Contractor vehicles inside the project site shall be permitted only after obtaining written approval. Vehicles shall be allowed to exit the project site only after submission of a written request in the prescribed form to the Security Officer through EIC, SMFC.
13. Inward and outward movement of the Contractor's materials shall be in accordance with the existing project procedures. Tools and equipment brought temporarily for execution of the work shall be permitted upon submission of a written request in the prescribed form, which shall be valid for 15 days. The Contractor shall be solely responsible for the security and safekeeping of their materials within the project site.
14. All prescribed forms referred to above shall be issued to the Contractor along with the Work Order.
15. The Department shall make all reasonable efforts to minimise inconvenience to the Contractor from a security perspective. However, any delay, inconvenience, or loss arising due to security requirements or unforeseen reasons shall not be grounds for any claim or compensation whatsoever against the Department.
16. Any breach of the above security regulations shall be viewed seriously and shall attract appropriate action as deemed fit by the Department.

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Clarifications for Pre-Bid Queries and Pre-Bid Meeting Held on 09/01/2026 at SMFC

Sr. No.	Refer Section, clause no. Page no. of the Tender Document	Clause mentioned in the Tender Document	Bidders Query	Any Change/ Amendment in the Tender Document	Amended Clause to be replaced in place of referred Original Clause in the Tender Document or Newly added clause in the Tender Document	BARC Clarification
(1)	(2)	(3)	(4)	(5)	(6)	(7)
1	NIT Point Number 3 at Page Number 3 of 28	The bidder should have satisfactorily completed (based on certification of performance by client of the works) 3 (Three) similar works each of value not less than ₹1280 Lakhs or 2 (Two) similar works each of value not less than ₹1920 Lakhs or 1 (One) similar work of value at least ₹2560 Lakhs during the last 7 (Seven) years ending on the last day of the month previous to the one in which the tenders are invited/the works completed up to previous day of the last date of submission of tenders shall also be considered and if the eligible similar works are not carried out in Central Government / State Government / Public Sector Undertaking of Central or State Governments / Central Autonomous bodies, then statement from income tax record should be produced by bidder, when requested by tender evaluating authority. The statement/ records produced should establish payment from the client to the bidder against similar work.	<p>With reference to the eligibility requirements of the above-mentioned tender, we wish to submit details of a similar work executed by us for your kind review and confirmation.</p> <p>We have successfully executed works for a private concern, XXXX Private Limited, for a total contract value of Rs. XXXX - + simple rate of 7% is XXXX Grand total XXXX during the financial year 2022–2023. The scope of work included Design, Engineering, and SITC of the following on an EPC / Turnkey basis for the construction of a factory-cum-administrative building (Ground Floor, First Floor, and Second Floor): Civil and PEB works, Fire Hydrant works, HVAC works, Aluminum joinery works, Electrical works, DG set and accessories, Above-ground water storage tank.... etc....</p> <p>We kindly request you to confirm whether the above-mentioned work and the enclosed documents are acceptable for meeting the eligibility criteria of this tender, enabling us to proceed with submission of our bid.</p> <p>Note: Name and Certain Details are hidden in the Query for maintaining confidentiality.</p>	No	Nil	<p>1. Any work carried out by bidder will be considered as per NIT Point 3- if the eligible similar works are not carried out in Central Government / State Government / Public Sector Undertaking of Central or State Governments / Central Autonomous bodies, then statement from income tax record should be produced by bidder, when requested by tender evaluating authority. The statement/ records produced should establish payment from the client to the bidder against similar work. However, It shall be single work order. Necessary documents as required work order copy/TDS/Completion etc. to be submitted.</p> <p>2. Evaluation of the Bidder will be carried out only after opening of Part-1 of Tender as per the criteria mentioned in the tender.</p> <p>3. Bidders are requested to go through the various Details / Eligibility conditions mentioned in the tender document.</p>
2	NIT Point Number 1 (vi) at Page Number 1 of 28	Estimated Cost - ₹27,12,00,000/- + GST as applicable	We have to Know the Estimated Cost is Including GST or Not	No	Nil	As mentioned - Estimated Cost - ₹27,12,00,000/- + GST as applicable the bidder quoted rates shall be exclusive of GST but inclusive of all other taxes, royalties, levy or cess applicable on last stipulated date of receipt of tender including extension “if any”.
3	NIT Point Number 2 (C) at Page Number 3 of 28	Average Annual Financial Turnover of the bidder should be at least ₹3200.00 Lakhs during the immediate last 3 consecutive audited financial years ending 31st March 2024. This should be duly audited by a registered Chartered Accountant and also should have valid Unique Document Identification Number (UDIN) of the practicing Chartered Accountant	Please consider MAAT for best 3 Years in Last 5 Years in place of the immediate last 3 consecutive audited financial Years ending with 31st March 2024	No	Nil	No. Tender Conditions Shall Prevail.
4	Section-V (iv) Electrical Specifications Page 37 of 120	Fire Class: Minimum F1 Certified	Fire Class: Minimum F1 Certified - We will comply Fire Class minimum F1, but we do not have test certificate. Please confirm.	No	Nil	F1 Certification is to be provided by OEM/Manufacturer of Transformer.
5	Section-V (iv) Electrical Specifications Page 41 of 120	Enclosure Material - The resin cast encapsulated transformer shall be skid mounted and provided with galvanized sheet steel enclosure with lift off horizontal panels for accessing terminals.....	As per specification, galvanized sheet steel enclosure is specified. We are considering CRCA steel enclosure. Please confirm.	No	Nil	No. Tender Conditions Shall Prevail. It shall be galvanized sheet steel enclosure as specified

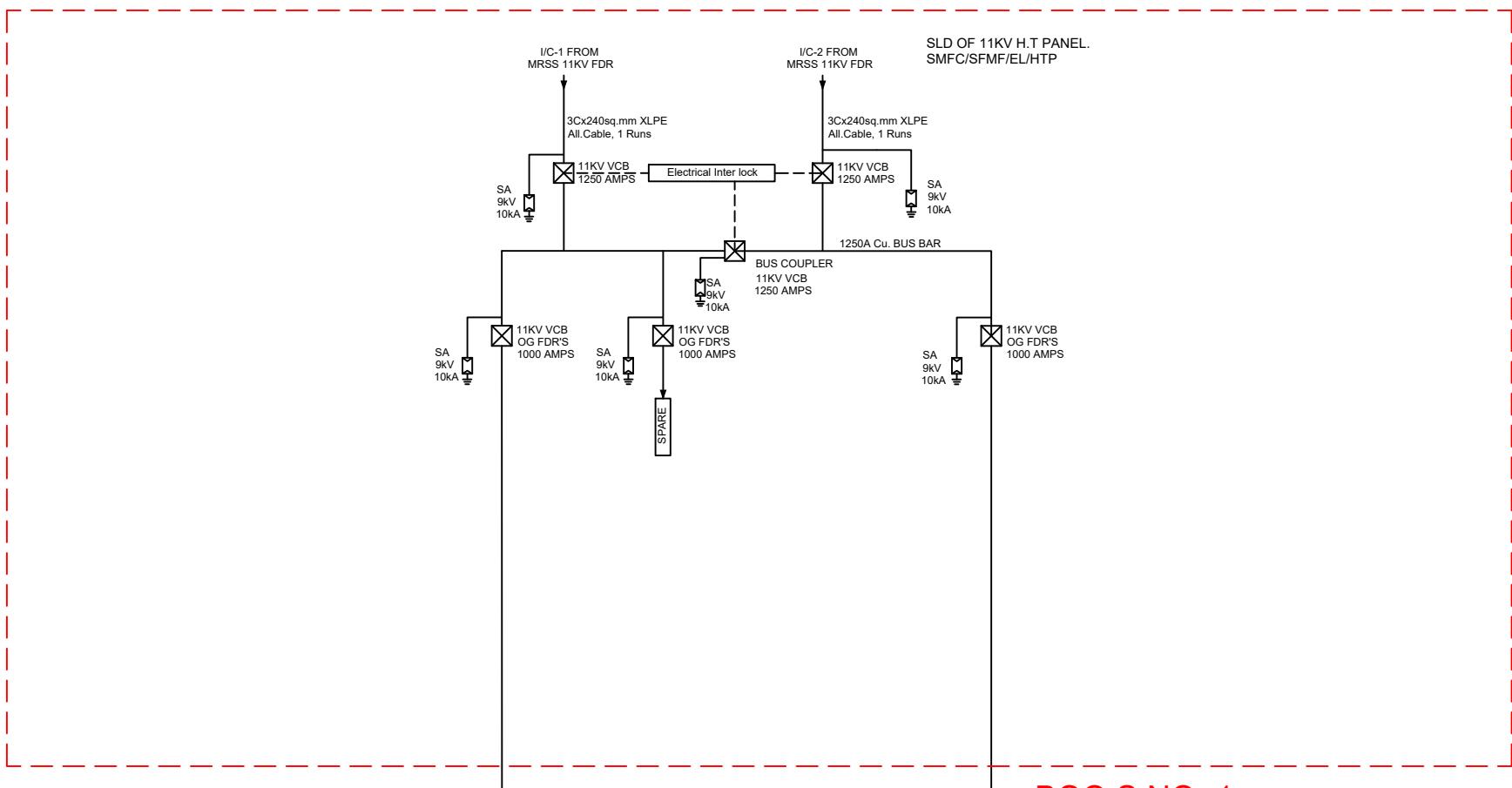
Sr. No.	Refer Section, clause no. Page no. of the Tender Document	Clause mentioned in the Tender Document	Bidders Query	Any Change/ Amendment in the Tender Document	Amended Clause to be replaced in place of referred Original Clause in the Tender Document or Newly added clause in the Tender Document	BARC Clarification
6	Section-V (iv) Electrical Specifications 36 of 120 and 41 of 120	IP Protection of Transformer IP-44 / 32	In the specification, IP-44 and IP-32 class is mentioned. Please confirm, which one to be followed.	No	Nil	IP-43/IP-44 or Higher IP rating Shall be Considered.
7	Section-V (iv) Electrical Specifications 37 & 38 of 120 and 45 of 120	Chapter -4 CRD Transformer	Spares- In the specification, at one place 2Nos. Of temperature scanners & cooling fans. At other location, each 1No. is specified. Please confirm the qty of spares required.	No	Nil	Spares to be considered 1. Two sets of spare tap links 2. Digital type temperature scanner with contacts for alarm and trip -2 No's 3. Fans for cooling -2 No's 4. Rollers one set
8	Section-V (iv) Electrical Specifications 37 & 38 of 120 and 45 of 120	Chapter -4 CRD Transformer	Losses - As losses are not specified, we are considering losses as per ECBC norms. Please confirm Current Density - Current density is not specified. Please confirm.	No	Nil	Losses are to be inline with ECBC / Relevant IS/IEC Codes both are accepted and the Transformers shall be as per Specifications. Current Density as per OEM/Manufacturer Standards.
9			Confirmation is required from BARC as an end user that the products which are to be used in the said tender/project falls under NINS (Not important for nuclear safety) category	----	----	Not Applicable. No certificate will be provided by BARC. Bidders Shall consider the same before submission of bid.
10			Confirmation from BARC is required that CLND (The Civil Liability for Nuclear Damage) Act, 2010 is not applicable for the said tender/project. If CLND Act is applicable, then a confirmation is required that customer is waving the right to recourse under the said Act against SE.	----	----	Not Applicable. No certificate will be provided by BARC. Bidders Shall consider the same before submission of bid.
11	Section-V (iv) Electrical Specifications	Chapter -6 LT Power Distribution Panels	Please confirm whether panels from authorized system integrators are acceptable.	No	Nil	Please refer chapter 17, Sr.No-1 of Electrical Specifications Page number 118 of 120, OEM and authorized systems house panel builder is accepted.
12	Section-V (iv) Electrical Specifications 51 of 120	Chapter -6 LT Power Distribution Panels	As per the specification, incomers, bus couplers, and outgoings are to be provided as per SLD with EDO/ equivalent latest model ACBs and ACBs/MCCBs with LSIG protection - SLD does not mention the kA rating, number of poles and the type of MCCB breakers (microprocessor-based or thermal magnetic). Please confirm the actual requirement	No	Nil	Wherever ACB's are mentioned in SLD it shall be EDO type - LSIG kA rating of ACBs Shall be - 50 kA minimum and others as per specification / as per approved design based on the kA rating co-ordination from Top to Bottom.
13	Section-V (iv) Electrical Specifications 51 of 120	Chapter -6 LT Power Distribution Panels	specification and SLD names/Typology not matching	No	Nil	Refer SLD mentioning the details and Typology
14	Section-V (iv) Electrical Specifications 51 of 120	Chapter -6 LT Power Distribution Panels	SITC of Mains Class IV Panel Type – 1 All incomers, Bus Coupler shall be provided with latest model Graphical Display having capability to measure THD, Power and Modbus and latest communication protocols as approved. Outgoings with digital MFM having capability to show THD, voltage, current etc. SITC of Mains Class IV Panel Type – 2 – Incomers with graphical Display as above and outgoings with Digital MFM capable of measuring THD SITC of Mains Class III Panel Type – 1 - Incomers with graphical Display as above and outgoings with Digital MFM capable of measuring THD Please confirm digital MFM is required for all outgoings.	No	Nil	For BOQ S.No - 4.01,4.02, 5.01 - Incomers and Bus couplers are to be provided with Graphical Display with analog Voltmeter, Outgoings are to be Digital MFM with features as mentioned. For BOQ S.No - 4.03, 4.04, 5.02,5.03 - Incomers, Bus couplers are to be provided with Graphical Display with suitable analog voltmeter, Outgoings are to be provided with Digital ammeters. For BOQ S.No - 6.01,6.02,6.03 Incomers, Bus couplers are to be provided with Digital MFM with features as mentioned with suitable analog voltmeter, Outgoings are to be provided with Digital ammeters. 4 Additional Graphical Displays are to be considered, which is to be specified during the drawing approval stage based on the load requirement.
15	Section-V (iv) Electrical Specifications 51 of 120	Chapter -6 LT Power Distribution Panels	6.2 Technical Parameters of Various Panels - Degree of Protection is given as IP-52 or above As all panels are being installed indoor, can we consider IP-42 protection. Please confirm	No	Nil	IP - 52 or above shall be considered
16	Section-V (iv) Electrical Specifications 118 of 120	Chapter -6 LT Power Distribution Panels	LT Panels Fabricator. OEM and authorized systems house of L&T, Siemens, Schneider Electric, Legrand, ABB and BCH	No	Nil	Please refer chapter 17, Sr.No-1 of Electrical Specifications Page number 118 of 120, OEM and authorized systems house panel builder is accepted.

Sr. No.	Refer Section, clause no. Page no. of the Tender Document	Clause mentioned in the Tender Document	Bidders Query	Any Change/ Amendment in the Tender Document	Amended Clause to be replaced in place of referred Original Clause in the Tender Document or Newly added clause in the Tender Document	BARC Clarification
17	Section-V (iv) Electrical Specifications	Chapter -2 & 10	DG and HT panel makes were not given	No	Nil	HT Panel Makes are same as LT Panel Makes DG Suggested Make list - Powerica / Jakson / Sudhir / Kirloskar / Caterpillar / Sterling Generators/Mahindra/Perkins / MTU/KEC/Stamford (CGT) / KEC / Leroy Somer AMF / Synchronizing Panel- D.G. set assembler and their authorised system house
18	Section-V (iv) Electrical Specifications	Chapter -7 & 8	Please Specify the stable size and it is a flat armoured around armoured Further regarding armoring, indicated Round Wire / Flat Strip, For below items 2cx16 sq.mm copper, 4cx25 Alu, 4cx120, 4cx240, 4cx400 , HT CABLES SIZE / CORE AND ALSO ARMORING FLAT STRIP OR ROUND WIRE ARMOUR,	No	Nil	All Cables with Flat / Round armoured are accepted
19	--		Describe the Miscellaneous item serial number 16	No	Nil	Query is not clear
20	Section-V (iv) Electrical Specifications	Chapter -6 LT Power Distribution Panels	Lt panel type 4 panel we could not found in SLD or technical specifications	No	Nil	LT Type-4 Panel is not shown in SLD, It is to be finalized as per process requirement during drawing approval stage.
21	Section-V (iv) Electrical Specifications	Chapter -3 & 17 HT Panels and Suggested Makes	Can you please accept HT panel as a system Integrator instead of OM?	No	Nil	Yes. HT Panel Makes are same as LT Panel Makes, Please refer chapter 17, Sr.No-1 of Electrical Specifications Page number 118 of 120,
22	Section-V (iv) Electrical Specifications	Chapter -4 & 17 Transformer and Suggested Makes	Transformer makes, we requested to add Esennar Transformers Pvt. Ltd. to be include.	No	Nil	Transformer Suggested Make list - Voltamp/ABB/CG/DTPL/Esennar/Schneider Electric/Kirloskar/Siemens/Raychem/Kanohar Electric/Urja Transformers/ Alstom
23	Section-V (iv) Electrical Specifications	Chapter -3 & 17 HT Panels and Suggested Makes	HT Panel as per Specifications -Please provide make list	No	Nil	HT Panel Makes are same as LT Panel Makes, Please refer chapter 17, Sr.No-1 of Electrical Specifications Page number 118 of 120,
24	Section-V (iv) Electrical Specifications	Chapter -3 HT Panels	SOQ 1.02 - Operational Spares as per attached annexure - Annexure not found in tender Doc	No	Nil	Refer Section 3.7 Operational Spares to be provided Of Electrical Specifications along with the mentioned list bidder shall also consider 1- Set (3 No's of CT's), 1 Set (3 No's) of PTs, 1 set (3 No's) of Vacuum bottles for VCB's
25	BOQ	BOQ-2 (Part-3-Electrical)	CRDT - SITC of 2.5MVA CRDT as per Specifications with Operational Spares as mentioned in TS -Please provide make list	No	Nil	Refer Query under S. No-7 (Makes of Same as per OEM Installed Transformer)
26	BOQ	BOQ-3 (Part-3-Electrical)	BOQ-3, 3.01, 3.02 - BUS DUCT - Please provide detail qty or Busduct layout & Substation Layout	No	Nil	Substation Layout is attached in Section -6 as Tender Drawings Exact Layout of bus duct will be based on the approved layout wrt to Transformer, LT Panel. In one substation Three Transformers are shown but it is to be considered as 2 No's of Transformers as per SLD.
27	Section-V (iv) Electrical Specifications	Chapter -6 LT Power Distribution Panels	LT AC Class-IV Distribution Panels as per Specifications - Please confirm whether the panel installation area is classified as a High Risk	No	Nil	Not Applicable. No certificate will be provided by BARC. Bidders Shall consider the same before submission of bid.
28	Section-V (iv) Electrical Specifications & BOQ	Chapter -6 LT Power Distribution Panels	SOQ-4 & 5 & 6- SLD Not Found For SITC of Mains Class IV Panel Type - 1 SITC of Mains Class IV Panel Type - 4 SITC of UPS Class II Class I Panel Type - 1 SITC of UPS Class II Panel Type - 2 SITC of UPS Class II Panel Type - 3 SITC of UPS Class II Class I Panel Type - 1 SITC of UPS Class II Panel Type - 2 SITC of UPS Class II Panel Type - 3	No	Nil	Refer SLD attached, Indicating BOQ S.No's Nomenclature indicated is temporary refer Attached SLD with this pre-bid queries. For BOQ Item S.No 5.01 Nomenclature is to be read as SITC of Mains Class III Panel Type - 1 For BOQ Item S.No 5.02 Nomenclature is to be read as as SITC of Mains Class III Panel Type - 2 For BOQ Item S.No 5.03 Nomenclature is to be read as SITC of Mains Class III Panel Type - 3
29	Section-V (iv) Electrical Specifications	G.I Ladder/Perforated Cable Trays	To include 'Cable Tech, Bangalore' Make Cable Trays	No	Nil	Bidder Submitted Various documents including supplying of cable trays to Govt Organisations /Test reports etc... Based on the above - Cable Tech Make cable trays can be considered. However, It shall fulfill Technical Specifications mentioned.

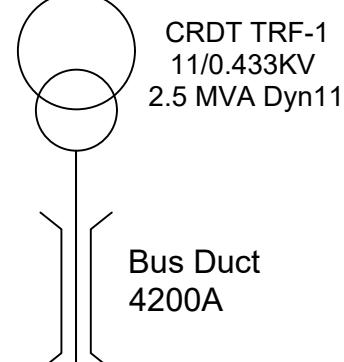
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30	BOQ	BOQ-7 (Part-3-Electrical)	SOQ - 7 Additional Breakers in the above panels as per specifications (All Panels S.N 4,5,6) 1200A ACB to install in the above panels without changing bus bar rating 400A -630A MCCB to install in the above panels without changing bus bar rating up to 200A MCCB to install in the above panels without changing bus bar rating Bidder says - We will quote for insulation excluding supply	No	Nil	Tender Conditions Shall Prevail. These are provided based on the actual process load requirement . These requirement will be finalized during the drawing approval stage. As approved/If required bidder shall provide these breakers in panels without changing Bus bar rating.
31	BOQ	BOQ-8 (Part-3-Electrical)	SOQ-8 SITC of 11kV (UE) HT Cable , Joint Kit and Termination Kit - Cable	No	Nil	Refer Chapter - 7 Of Electrical Specifications and Description SOQ for Specifications.
32	BOQ	BOQ-12 (Part-3-Electrical)	SOQ-12 Cable Trays - Please confirm type of Tray ladder type or Perforated type	No	Nil	all cable Trays are Ladder type except SOQ 12.1 (100mm width)- which shall be perforated or ladder type based on the actual site condition as per requirement.
33	BOQ	BOQ-13 (Part-3-Electrical)	SOQ-13 SITC of DG and AMF Panel - Please provide make list	No	Nil	DG Suggested Make list - Powerica / Jakson / Sudhir / Kirloskar / Caterpillar / Sterling Generators/Mahindra/Perkins / MTU/KEC/Stamford (CGT) / KEC / Leroy Somer AMF / Synchronizing Panel- D.G. set assembler and their authorised system house
34	BOQ	BOQ-20.05 (Part-3-Electrical)	SOQ-20.05 - Excavation of cable trench in ground 1000mm Depth X 500mm width for laying of cable as per direction of EIC - Excavation -	No	Nil	Soft and decomposed rock. Hard Rock will be measured in relevant Civil SOQ Item in Cum basis.
35	BOQ	BOQ-20.07 (Part-3-Electrical)	SOQ-20.07 - Supply and Installation of 1hP Surface pump with all required accessories - Please provide make	No	Nil	Kirloskar/ABB/Crompton/ CRI/V-guard/ Havells/Texoma/L&T
36	BOQ	BOQ-6 (Part-1-CIVIL)	Filling available earth within the plant boundary (excluding rock) in trenches, plinth, sides of foundations, roads etc. in layers not exceeding 20cm in depth, consolidating each deposited layer by ramming and watering, lead up to 50 m and lift up to 1.5 m. - Supply of Soft Earth for back filling to be arranged from outside or existing earth inside the plant to be used Please Clarify?	No	Nil	Inside the plant.
37	---	----	Approval duration of Drawings, Makes and any other document	No	Nil	Time period for approval of design documents and drawings: For Part - I - Civil Works & Part - II - Pre-Engineered Building Works the timelines are given in the specifications For Part - III - Electrical Works: In order to execute many number of SOQ items the duration is considered as 7 Days in First Instance of SOQ item, 3- Days in Subsequent Correction/Commented/Revised/Addition details/Requested etc.. Details Submission.
38	---	----	Payment Duration For Payment Bills, GST Reimbursement etc..	No	Nil	it is to be considered same as RA Bills.

Sr. No.	Refer Section, clause no. Page no. of the Tender Document	Clause mentioned in the Tender Document	Bidders Query	Any Change/ Amendment in the Tender Document	Amended Clause to be replaced in place of referred Original Clause in the Tender Document or Newly added clause in the Tender Document	BARC Clarification
39	Section-I-NIT, Clause-V.29.vii); Page no. 18	Bidder should be registered under EPF & ESIC and as per law. Bidder shall pay EPF & ESIC of contract workers to concerned Department and it will be reimbursed to him by BARC after satisfying that it has been genuinely paid by the bidder based on documentary evidence. The bidder shall not consider EPF & ESIC in his rates. Bidder shall comply provisions of the EPF Act, 1952 in respect of all the eligible employees / workers/ labors and submit the documentary proof regularly with every RA Bill.	Can we Provide workmen compensation policy in the place of ESI during execution of work	Yes	Bidder should be registered under EPF and as per law. Bidder shall pay EPF of contract workers to concerned Department and it will be reimbursed to him by BARC after satisfying that it has been genuinely paid by the bidder based on documentary evidence. The bidder shall not consider EPF in his rates. Bidder shall comply provisions of the EPF Act, 1952 in respect of all the eligible employees / workers/ labors and submit the documentary proof regularly with every RA Bill. Bidder should ensure that all their employees /workers/ labors (working at BARC premises) should be covered either under Employees Compensation Insurance Policy/ Group Insurance/ Personal Insurance Policy or ESIC. In case of ESIC; Bidder should be registered under EPF and as per law. Bidder shall pay ESIC of contract workers to concerned Department and it will be reimbursed to him by BARC after satisfying that it has been genuinely paid by the bidder based on documentary evidence. The bidder shall not consider ESIC in his rates. Amount towards Employees Compensation Insurance Policy/ Group Insurance/ Personal Insurance Policy will not be reimbursed.	Yes. Please refer to the amended clause .
40	-	-	Whether the CAR policy is applicable for this Tender	Yes	The contractor shall obtain CAR policy for the contract value, valid for the contract period including extensions if any, from a nationalized insurance company.	Yes. Please refer to the newly added clause in the Tender Document
<p>Notes: (1) The amended clause (if any) mentioned (under Column (6)) above supersedes and replaces the original clause in the tender document. (2) In the event of any discrepancy or conflict between the original clause/ amended clause (if any, under Column (6) above) and clarifications provided (under Column (7) above), the original clause/amended clause (if any) shall prevail. The clarifications (under Column (7) above) provided are intended solely for the purpose of further clarity and understanding, and they do not supersede or modify the original clause/amended clause. Bidder(s) are advised to consider the original clause/amended clause (if any), for their submissions. (3) If there are varying or conflicting provisions made in the tender document, the Accepting Authority (mentioned in Schedule "F", Refer Section-VII (i)) will be the deciding authority with regard to the intention of the tender document and his decision will be final and binding on the bidder(s). (4) The Accepting Authority (mentioned in Schedule "F", Refer Section-VII (i)) will have the sole authority to interpret the meaning and intent of this Tender Document. The interpretation of the Accepting Authority shall be final and binding on all Bidder(s).</p> <p>*****</p>						

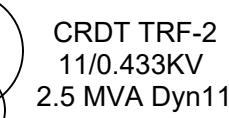
Substation - 2 SLD



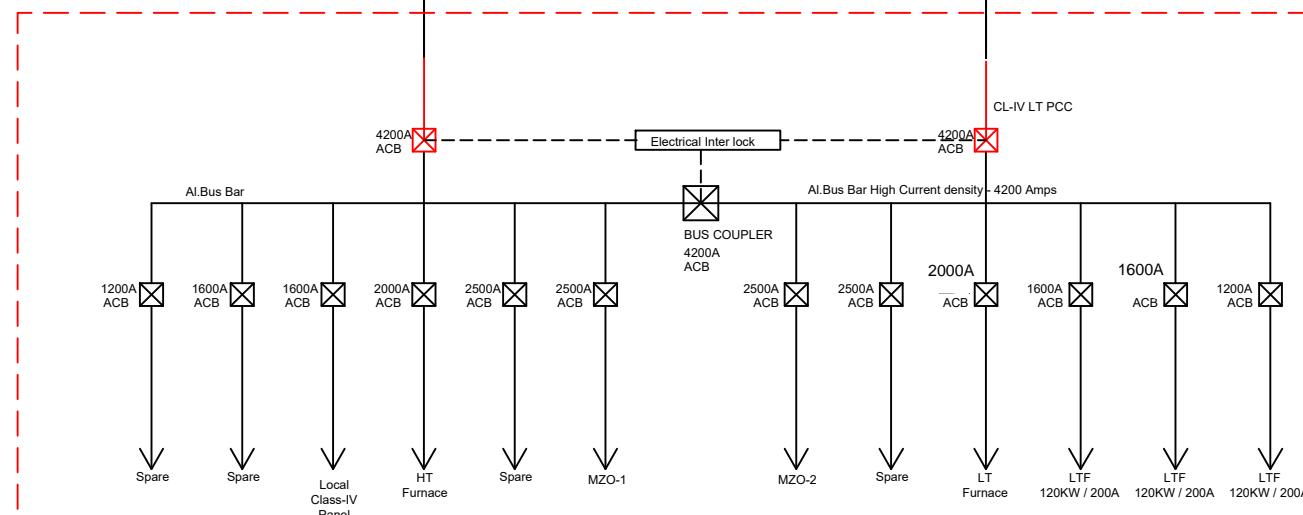
BOQ S.NO -1
Specs -Chapter-3 11 kV HT Switch Gear Panel



Bus Duct
4200A



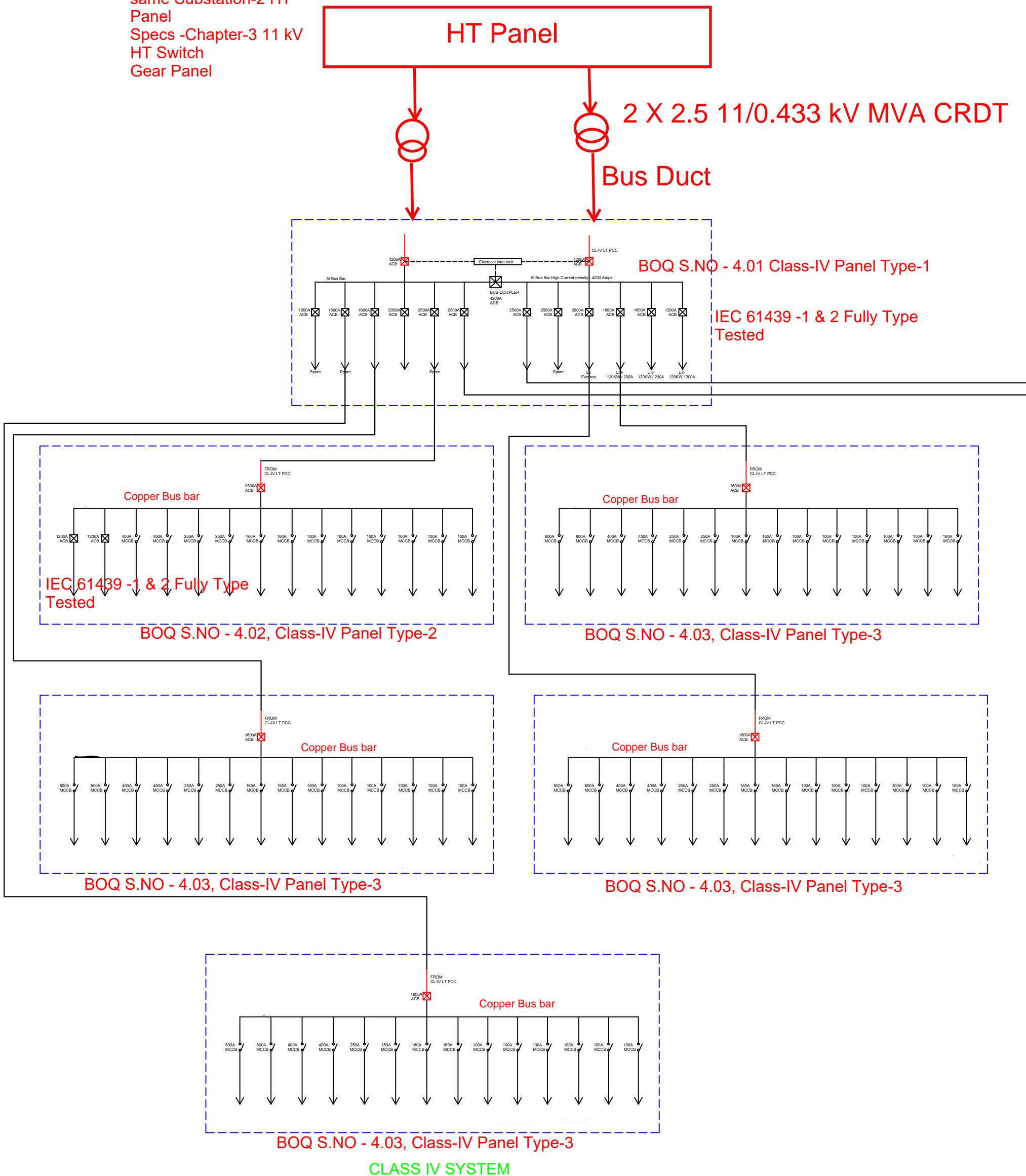
Bus Duct
4200A



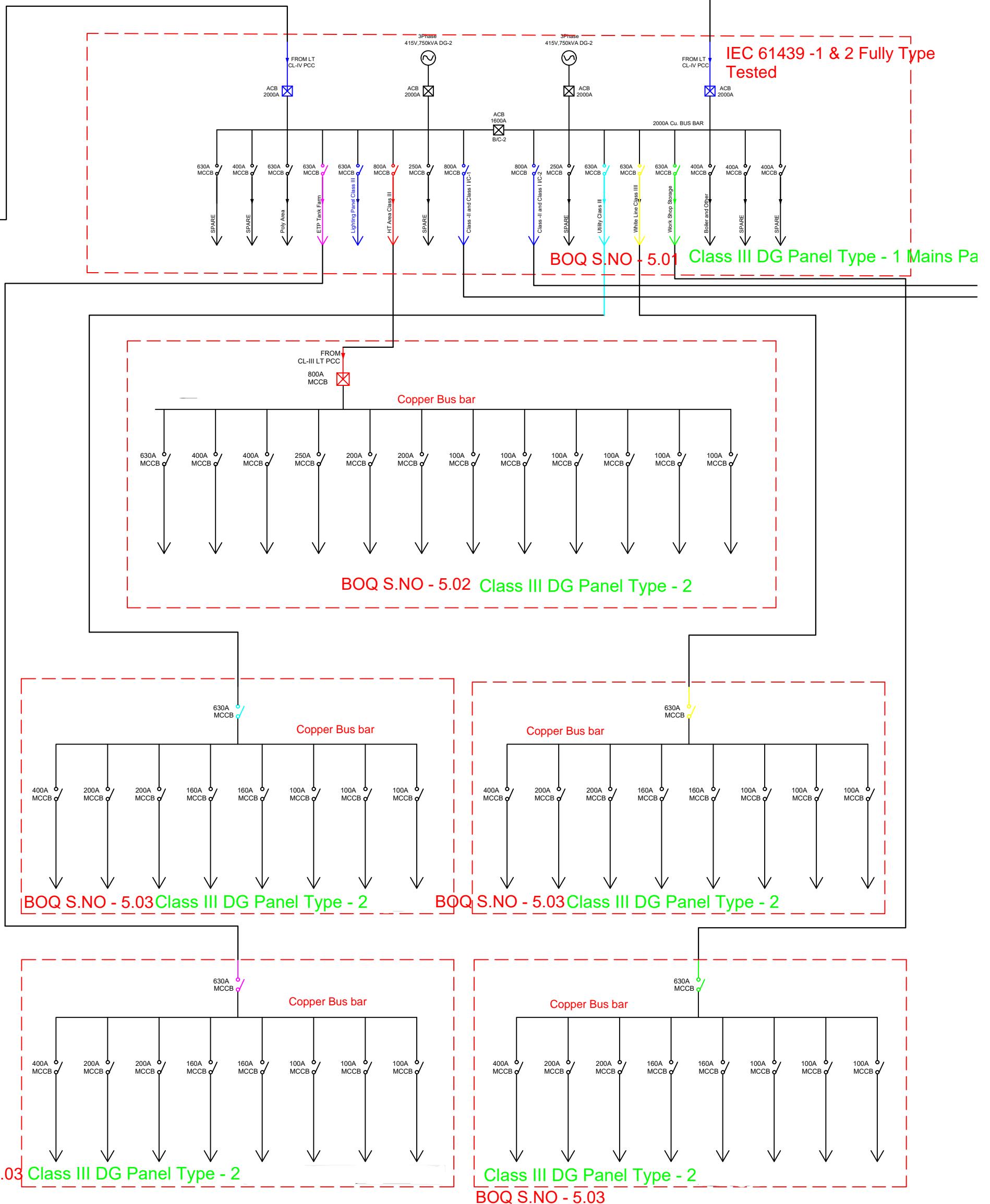
IEC 61439 -1 & 2 Fully Type
Tested

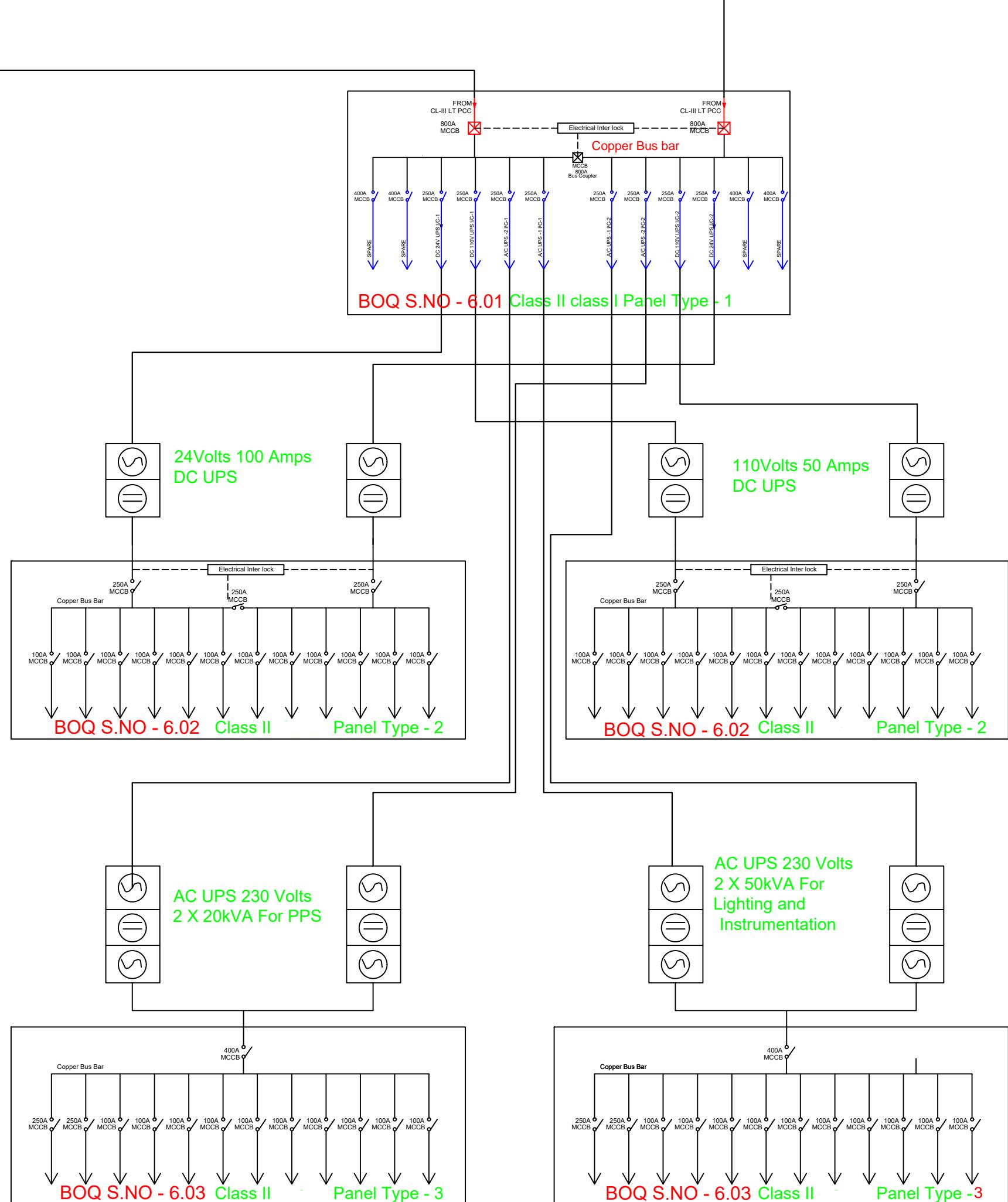
BOQ S.NO - 4.01 Class-IV Panel Type-1

BOQ S.NO -1 Drawing
same Substation-2 HT
Panel
Specs -Chapter-3 11 kV
HT Switch
Gear Panel



Note - BOQ S.NO - 4.04, Class-IV Panel Type-4 is not Indicated in SLD, Location and Incomers is to be Finalised as per Process load requirement during the Execution Stage.





CLASS II & CLASS I SYSTEM

APPENDIX -‘A’

BID SECURITY (BANK GUARANTEE)
(on Non-judicial stamp paper of value ₹ 100/-)

WHERE AS _____ (Name of Bidder) (herein after called “the Bidder”) has submitted his bid dated _____ (date) for undertaking the work of _____ (Name of work) (hereinafter called “the Bid”).

KNOW ALL PEOPLE by these presents that We _____ (Name of bank) of _____ (Name of country) having our registered office at _____ (hereinafter called “the Bank”) are bound to President of India, acting through Chief Engineer, BARC, Trombay, Mumbai 400 085 for the sum of ₹ _____ (1) for which payment will and truly be made to be said BARC, Trombay, the Bank binds itself, his successors and assigns by these presents.

SEALED with the common seal of the said Bank this _____ day of 2011.

THE CONDITIONS of this obligation are:

- (1) If after Bid opening the Bidder withdraws his Bid during the period of Bid validity specified in the Form of Bid or makes any modification in the terms and conditions of the tender which are not acceptable to BARC, Trombay OR
- (2) If the Bidder having been notified of the acceptance of his Bid by BARC, Trombay during the period of bid validity
 - (a) Fails or refuses to execute the Form of Agreement in accordance with the instructions of Bidders, if required; OR
 - (b) Fails to commence the work specified in the tender document in prescribed time.

We _____ (Name of the Bank & Branch) undertake to pay BARC upto the above amount upon receipt of their first written demand, without BARC, Trombay having to substantiate their demand, provided that in their demand BARC will note that the amount claimed by them is due to them owing to the occurrence of one or any of the above conditions, specifying the occurred condition or conditions.

This Guarantee will remain in force up to and including the date _____ (2). This date may be extended by Chief Engineer, BARC, notice of which extension(s) to the Bank is hereby waived. Any demand in respect of this Guarantee should reach the Bank not later than the above date.

DATE _____ SIGNATURE OF THE BANK _____

WITNESS _____

SEAL _____

(Signature, name and address)

Notes:

1. The Bidder should insert the amount of Guarantee in words and figures denominated in Indian Rupees. This figure should be the same as specified in the tender document.
2. This date should be 45 days after the end of validity period of the Bid, reckoning from the deadline for submission of Bids which is stated in the tender document.

Additional Clarifications and Specifications Raised by Bidders:

Bid clarifications for certain items are enclosed and shall form a part of the tender document. It shall be deemed that all bidders who submit their bids have read and accepted these clarifications.

Query	Clarification
HT & LT Panels SOQ No 1 to SOQ No-6.	In SLD Bus-bars shown some places as Aluminum due to typo error. Bidder shall consider Bus-bars are of Copper Material For all Panels as per specifications from SOQ No 1 to SOQ No-6.
Electrical Specifications Page No-115&116 Desktop Computer. 512TB HDD doesn't existing in the Single HDD, please clarify	Bidders shall read it as 512 GB SSD/HDD instead if 512 TB HDD.
SOQ no 17 SITC of AC and DC UPS System as per Specifications	There is missing Pages from Page No 100 to 102 in The Specifications due to Some error. Specifications mentioned herewith this document and bidder shall consider these specifications.

All other tender conditions remain unchanged.

Chapter -13:

13.1 Specifications for

SOQ 17.01 - 24 Volts 200 Amps DC UPS system with batteries– **Battery Backup of 2 Hrs.**

SOQ 17.02 - 110 Volts 50 Amps DC UPS system with batteries – **Battery Backup of 2 Hrs.**

13.1.1 Scope of the work:

The intent of this specification is to define the requirements of Float cum Boost Charger (FCBC) system and associated battery bank with accessories etc. Tenderer's scope of work Includes design, manufacture, testing, Pre dispatch inspection, packing and delivery to site and testing & commissioning of the complete FCBC systems with battery banks etc., as per this specification, data sheet.

13.1.2 Standards:

In general, the equipment covered by this specification shall, unless otherwise specified, be in line with the requirement of any of the latest applicable standards of

- a) Bureau of Indian Standards
- b) International Electro Technical Commission
- c) Wherever the requirements in this specification are in conflict with any of the above Standards, the requirements under this specification shall be binding.
- d) In case any contradiction between various referred standards/specification/data sheets and statutory regulation etc.,, the following order of priority shall be governing.
 - i. Schedule of rate
 - ii. Data sheet
 - iii. Standard specification
 - iv. Codes & standard

13.1.3 General Requirements & Technical Parameters:

S. No	Parameter	Requirement
1	Product Name	Float Cum Boost Charger (DC UPS)
2	Rating	As per SOQ/BOQ
3	Input Ac Supply	
	a) Voltage	3φ-4wire, 415V AC, ±10%
	b) Frequency	
	c) Power Factor	≥ 0.8 at rated load at minimum input
4	Type of Rectifier	3φ, Full wave-controlled bridge, Silicon Controlled Rectifier
5	Reference Standard	As per IEC - 60146
6	Automatic voltage regulator type	Static control, constant voltage current limit
7	Output DC	
	a) Auto Float voltage (Nominal)	As recommended by battery manufacturer for 12V VRLA Battery (Same to the load)
	b) Output continuous current	As per rating / SOR

	c) Manual Boost voltage Adjust (Through potentiometer)	As recommended by battery manufacturer 12V VRLA Battery
	d) Battery charging current Adjust (Through potentiometer)	As recommended by battery manufacturer 12V VRLA Battery
8	Auto / Manual feature	To be provided
9	DC Volt regulation from no load to full load	$\pm 1\%$ of set value across filter capacitor
10	Maximum ripple content at rated load	$\leq 1\%$ RMS without battery connect
11	Efficiency at rated load nominal input	$\geq 80\%$
12	Rectifier input Transformer (IS-11171)	Dry type Isolation Transformer of suitable rating is required.
13	Protections & Controls	
	a) Output soft start feature	To be provided
	b) DC Over load	110% for short time
	c) Blocking Diode at FCBC output	To be provided
	d) Input & Output	MCB/MCCB
	e) Battery	MCCB
	f) Short circuit	To be provided
	g) DC Over volt, Output current limit & Battery current limit	To be provided
	h) Input under/over volt, Over load	To be provided
	i) Snubber circuit for Thyristor	To be provided
14	Battery Type	12V, SMF-VRLA
15	Measuring instruments	Analog Meter, Flush mounted, 90° Scale, 96Sqmm, Accuracy Class 1.0 a) AC Voltmeter b) DC Output Voltmeter (FCBC/Battery) c) DC Output Ammeter d) Battery Ammeter

16	Indications & alarms with Window annunciation	<ul style="list-style-type: none"> a) RYB Healthy b) Output ON c) AC under/Over voltage d) Charger on Float e) Charger on Boost f) DC Under Voltage g) DC Over Voltage h) AC Over load i) Mains unhealthy j) DC earth fault k) FCBC fault l) Overload m) Battery Under Voltage
18	Potential free contacts for remote signaling	Potential free 'NO' relay contacts for DC Charger fault, Common alarm
19	Transducers for remote monitoring	To be provided as approved
20	Internal wiring	FRLS PVC
21	Enclosure	IP 42 according to IEC 60529, Powder Coated RA 7032 or approved shade with forced Air ventilation.
22	Ripple Voltage	Less than 1% without Battery connected
23	Automatic voltage regulation	Static control with constant voltage & constant current limit.
24	Filter	Input side line filter
25	Overload Capacity	Capable of withstanding 110% overload for short duration
26	Charging	Automatic Float & Boost charging selection as per battery charging state (voltage level). Facility of Constant Voltage (Adjustable) & constant current(adjustable) boost
27	Mode selection switch	Selector switch For Float / boost and Auto / Manual
28	Type, control technology of Rectifier	The circuit should be conventional SCR based, fully wave rectifier
29	Efficiency	$\geq 80\%$ at rated load and nominal input voltage
30	Input Harmonics	As per IEEE 519 (Total demand distortion not more than 5.0%)
31	Protective Features	
a	Input Mains	Mains Over voltage, under voltage, phase failure
b	Charger DC Output	Over voltage, short circuit, overload, over temperature
c	Blocking Diode	In the event of AC input failure, to avoid reverse drainage of battery in to the system
d	Battery	Under voltage at battery terminal, Battery over charge, Battery Over current

e	Rectifier & Battery charger	Maximum current limiting, over temp. Trip, Boost charging and float charging current limiting with backup protection against overcharging.
f	Input and output control	Suitable breakers to be provided
g	Fuses	Suitable fuses to protect the system wherever is required
h	PIV of Thyristers (Peak Inverse voltage)	Min.1200V

13.1.4 Environmental Conditions:

The Float cum boost charger shall be designed and constructed for continuous operation at full load under the climate and environment conditions as described in the specification. The FCBC shall be installed in Electrical / Control room buildings / any other location as approved and shall be designed for non-air-conditioning ambient.

13.1.5 Components and Conditions:

- i. The Contractor has to take care that all components and equipment are selected considering easy maintenance, simple and quick diagnosis and long maintenance intervals. All components and equipment shall be designed for continuous duty at rated load and under the given climate conditions. Standard industrial high-performance systems and components shall be used as far as Possible. Components and equipment of same kind and type shall be selected for equivalent functions. The interchangeability must be guaranteed.
- ii. FCBC system shall be free from workmanship defects. Sharp edges, nicks, scratches, burs etc., all fasteners shall be fixed properly. The equipment shall be complete with all parts and all parts shall be functional.

13.1.6 Tagging:

All components, equipment and installations shall receive the respective tagging plates, labels, etc., which have to be of extremely durable material resistant against the environmental conditions. Tagging plates or labels on fronts of enclosures shall be fixed with screws. For further requirements, reference is made to specification. All wiring inside the FCBC shall be neatly arranged & ferruled.

13.1.7 Basic Particulars for Design:

- i. Suitable for industrial application.
- ii. The rating of the system shall be as per Schedule of Rates at ambient specified in design Basis/Data sheet.
- iii. Charger rectifier shall be 6-Pulse SCR based.
- iv. Standalone system with auto/Manual Float boost changeover to Battery bank as per data sheet, Schedule of rates and drawing.
- v. The load shall normally be fed from the FCBC in float mode.
- vi. Battery shall be suitable to maintain the DC power supply to load in the event of mains failure or Charger failure.
- vii. Contactor logic to be provided to avoid boost voltage appearing across load as per the configuration, without interruption to the load in the event of Charger failure.
- viii. Panel illumination to be provided.
- ix. Acoustic noise level at a distance of 1mtr from FCBC panel shall not exceed 75dBA.

- x. All wound elements shall be copper wound.
- xi. Isolation Transformer shall be provided as approved.
- xii. Total Harmonic Distortion (THDi) at input shall not greater than 5%.

13.1.8 Permissible Variations:

FCBC input supply from EB source: - Voltage: +10% & -10% of nominal & Frequency +/- 5%
 DC Load Voltage while delivering at its rated capacity: - Voltage: ±10%

13.1.9 Protective Features, Indications & Alarms:

i. PROTECTIVE FEATURES:

- a) **Input** -Mains Over voltage, under voltage, Phase failure.
- b) **Rectifier** - Under/Over voltage, Float/Boost mode, Charging current limit, short circuit, overload, over temperature.
- c) **Battery** - Under voltage, Battery over charge, DC Earth Fault.

ii. INDICATIONS & ALARMS:

Following indications & alarms for faults and status shall be provided in window annunciator on front panel as minimum.

- a) Mains Fail, Mains Over/Under voltage
- b) Charger Fail, Over/Under voltage
- c) FCBC Overload
- d) Load on battery
- e) Battery Over/under voltage
- f) Battery low
- g) Battery earth fault
- h) Load on Battery
- i) Battery charging on Auto/Manual mode.
- j) Battery on Float/Boost
- k) Over Temperature

Analogue Panel Metering (96x96mm size) shall be provided for Charger parameters as minimum for the following. Input AC Voltage with selector switch, Output DC Voltage, current Battery current and voltage etc.

Above list is indicative actual requirement of Indications & Alarms etc will be finalized as per requirement.

- iii. **AUDIBLE ALARMS WITH** Mains Failure, Battery Low, FCBC Fail, FCBC Under-voltage, Over-voltage, Over Temperature, FCBC Overload etc to be provided as approved.

13.1.10 Transformer (Input Isolation Transformer):

Rating suitable for the application & as per IEC726/IS-1171. It is to be Dry type, copper conductor
 Page 6 of 23

with class 'H' insulation. Transformer must be double wound and galvanically isolated from input supply.

13.1.11 Rectifier / Battery Charger:

- a. Primary input circuit breakers (MCB/MCCB) to feed rectifier.
- b. The rectifier circuit should be SCR based Phase controlled.
- c. Transient and surge protection circuit in input circuit to protect charger from surges and Voltages Spikes.
- d. Charger size shall be based on the maximum load current and recharging current (in maximum time of 10 hours after discharge).
- e. Necessary smoothing Chokes and filters.
- f. Automatic boost and float charging control.
- g. Protective features like Maximum current limiting, Over temp Trip, Boost charging and float charging current limiting with backup protection against overcharging.
- h. Charger shall simultaneously supply entire power necessary for DC loads connected and to keep the battery of required capacity in fully charged condition. Provision for automatic charging in both float and boost shall be made.

13.1.12 Charger logic:

- a. When AC input supply to the charger is failed, then the battery should automatically connect to load without any interruption.
- b. Current limits shall be provided independently for charger load current and battery current.
- c. When battery is connected to charger under float mode, the battery current shall be monitored, controlled and limited to the set value automatically.
- d. The output voltage shall be limited to maximum of $\pm 10\%$ of nominal system voltage when battery is float charging while feeding the load. Vendor shall specifically ensure that the charger output voltage does not exceed the recommended limits under any fault condition.
- e. Silicon diodes to connect at 80% Tap of battery bank shall be provided to maintain continuity of dc supply to load if necessary.

13.1.13 Constructional Features:

- a. Unitized construction and shall be manufactured as per IEC:60146, IEC60950.
- b. It is free standing, floor mounted, indoor type and complete with all interconnections.
- c. Dust and vermin proof. Load bearing parts shall be minimum 2.5mm thick for load bearing parts, 1.6mm for doors and covers.
- d. Units shall be self-contained and serviceable.
- e. The arrangement and layout shall facilitate easy and convenient supervision of system while running as well as quick detection of disturbances and troubleshooting.
- f. Copper earth bus bar shall run throughout the length of Panels. All doors & non-current carrying metallic parts shall be suitably earthed.

13.1.14 Enclosure and Ventilation: Enclosure are to be conforming to minimum IP-42 class and Units shall be provided with cooling fans.

13.1.15 Battery unit:

- a. Ampere-hour capacity of the battery shall be selected on the following basis: Nominal of battery bank voltage: as approved with minimum of **2 Hrs backup** and Minimum end cell voltage shall be 1.75V per cell for SMF-VRLA battery.
- b. The scope also involves supply, installation and commissioning of Battery Banks –SMF-VRLA, 12V battery modules along with battery stands, terminal connections and cabling from FCBC to battery banks. Battery Bank shall be capable of delivering required 2Hrs backup at rated load. Battery sizing calculation to be submitted for BARC approval.
- c. Stationery batteries of type as per data sheet/specification complete with all required accessories as applicable including but not limited to the following shall be supplied with each battery set.
 - i. Battery stands shall be as per battery manufacturer's standard shall be provided.
 - ii. Cell testing voltmeter complete with leads - (1 no. Per set).
 - iii. Spanner (1 no. Per set).
 - iv. Battery isolation unit in sheet steel enclosure shall be provided near to battery bank.

13.1.16 Drawing and Documents:

- i. Contractor shall submit GA & SLD showing major components / configuration, Battery sizing calculation, Battery bank GA/stand size, FCBC panel size, BOM,, Schematic Wiring diagram, Control & Protection philosophy, List of indication & audio alarms etc to be submitted for approval.
- ii. Final drawings, operation & maintenance manual and erection instructions to be submitted.

13.1.17 Inspection & Testing:

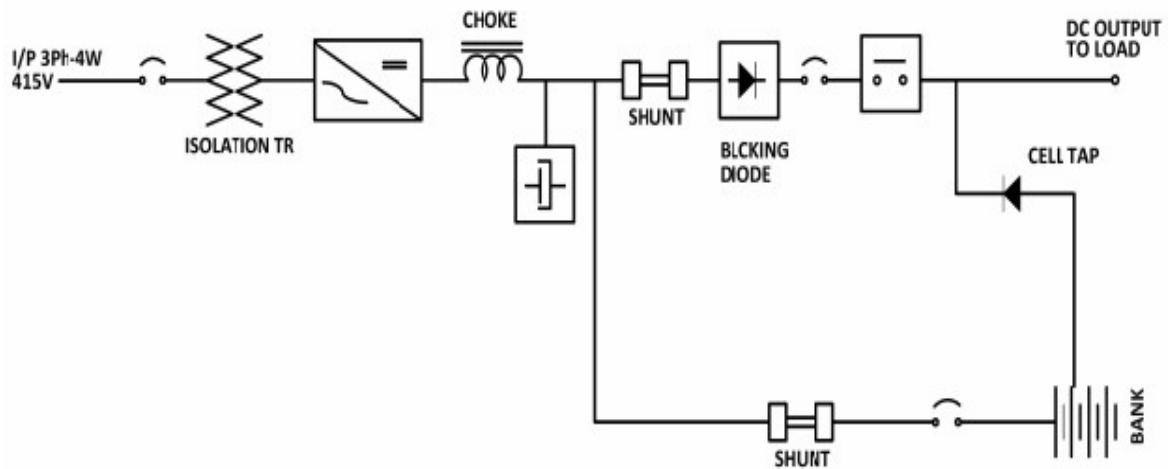
- i. Inspection and testing of equipment's shall be carried out by BARC/ BARC nominated inspection agency at the Manufacturer's works prior to dispatch on final product to ensure conformity of the same with acceptable criteria of technical specifications, approved drawings and national/international standards.
- ii. The inspection for FCBC systems & Battery Bank shall be as per 100%.
- iii. The Contractor shall submit Quality Assurance plan (QAP).
- iv. Final acceptance testing along with the batteries shall be done at site. Site acceptance test procedure shall be submitted by the contractor along with QAP.

13.1.18 Spares to be supplied with UPS:

Contractor shall supply following Spares without any extra cost for both UPS together.

1. For each kVA – 1 No's of UPS cards for each kVA.
2. 2 No's of additional batteries for each kVA rating.

13.1.19 SLD:



---END---

13.2 Specifications for

SOQ 17.03 -Part-3 Electrical SITC of 2 X 20 kVA Double conversion, Parallel redundant UPS system with Batteries – Battery Backup of 2 Hrs.

SOQ 17.04 -Part-3 Electrical SITC of 2 X 50 kVA Double conversion, Parallel redundant UPS system with Batteries – Battery Backup of 2 Hrs.

13.2.1 Scope of the work:

The intent of this specification is to define the requirements of uninterrupted power supply system, Rectifiers, Inverter system and the associated battery sets etc.

Tenderer's scope of work Includes design, manufacture, testing, Pre dispatch inspection, packing and delivery to site and testing & commissioning of the complete UPS system with static by-pass and battery banks etc., as per this specification, data sheet.

13.2.2 Standards:

- i. In general, the equipment covered by this specification shall, unless otherwise specified, be in line with the requirement of any of the latest applicable standards of
 - a) Bureau of Indian Standards
 - b) International Electro Technical Commission
- ii. Wherever the requirements in this specification are in conflict with any of the above Standards, the requirements under this specification shall be binding.
- iii. In case any contradiction between various referred standards/specification/data sheets and statutory regulation etc., the following order of priority shall be governing.
 - i. Schedule of rate
 - ii. Data sheet
 - iii. Standard specification
 - iv. Codes & standard

13.2.3 General Requirements & Technical Parameters:

Rating	As per SOQ
Application	Industrial Application
Input	3 Phase LT,50Hz with allowable fluctuations
Output	Single Phase LT, 50Hz
Cables	As per approval – If the suitable size is not available contractor shall arrange the cables without extra cost Cables shall be FRLS
Type	Online, 100% parallel redundant type with static bypass as approved. True online double-conversion technology with high

	power density, utility frequency independence, and generator compatibility	
Rectifier	IGBT based Space Vector PWM Converter	
Inverter	IGBT based PWM Inverter	
Display & Monitoring	LCD Display	
Reference Standard	Safety, EMC, Performance - IEC / EN 62040-1,2,3	
Isolation Transformer	Dry type Isolation Transformer of suitable rating is required.	
Power Factor (Input)	≥ 0.98 at nominal input voltage & full load.	
Input Current Harmonics (THDi)	$\leq 5.0\%$ (Input Voltage THD<1% and at rated input voltage)	
Bypass	Nominal Input Voltage	230V AC, 1Ø - 2 wire
	AC Power Connection	1Ø - 2 wire + Ground
	Voltage Range	$\pm 10\%$
Battery	Battery Type	12V, SMF-VRLA
	Nominal Voltage & Ah	As per approved Design fro Back up of 2 Hrs
	Battery Charging Type	Float / Boost (Constant Voltage & constant current mode boost charging with Auto & manual selection)
	Battery Charging Current	10% of AH capacity
Output	Voltage	230V AC, 1Ø - 2 wire + Ground, Pure Sinusoidal
	Voltage, Frequency Regulation	Apprx. $\pm 1\%$ (Individual unit), $\pm 2\%$ (in parallel condition) Frequency $\pm 0.5\%$ free running, 1Hz / sec Slew rate
	Rated Power Factor	0.8 lagging
	Voltage Distortion	$\leq 2\%$ for linear loads, $\leq 5\%$ for Non-linear loads (as per IEC 62040-3)
	Crest Factor	as per IEC 62040-3)
	Inverter	$\geq 90\%$ at rated load

	Efficiency	
	Inverter Overload Capacity	> 100% to 125% for 10 minutes > 125% to 150% for 01 minute
	Inverter Voltage Transient	±5% rms (Min. Load: 20%. Transient load: 80%) (As per IEC 62040-3)
	Recovery Time	≤ 40msec to within ±1% of nominal voltage (As per IEC 62040-3)
	Fuse clearing Capability	20% of UPS nominal current rated fuse (IEC 60269) by inverter within the specified time based on fuse characteristics. With bypass available & battery connected. Fuse can be cleared by the bypass.
User Interface	Parameters in LCD Display	Input : Voltage, Frequency, Current, Power
		Battery : Voltage, Current
		Bypass : Voltage, Frequency
		Output : Voltage, Frequency, Current, Power, Load%
	Status indications in LCD	Like - Input Healthy, Converter ON, Converter Trip, Load on Battery, Inverter ON, Inverter Trip, Load on UPS, Load on Bypass, Bypass Healthy, Over Temperature etc as approved
		Like Converter ON, Input UV/ OV, Converter Trip, Load on Battery, Battery Low, Inverter Trip, Output UV / OV, Overload, Load on Bypass, Inverter Async, Over Temperature, System Fault, Short Circuit etc as approved
		RS 485 MODBUS Protocol
Mechanical	Degree of Protection	Min IP 42 according to IEC 60529
	Paint Shade	Powder coated paint RAL 7032 or approved shade
	Cable Access	Bottom Front

	Cooling	Forced Air
Isolation Transformer	Input Isolation Transformer of suitable rating must be provided at the incomming of each UPS	
System fault level	Min 10 KA for 1 sec	
Type of Converter & inverter	The Converter & Inverter circuit should be IGBT based, fully microprocessor controlled with PWM Technology or Latest proven technology.	
Inverter Overload Capacity	>100% to 125% for 10 minutes >125% to 150% for 01 minute 200% for 200 msec.	
Mode of operation	Dual/parallel Redundant with static bypass & Dual Redundant rectifier, inverters as specified in SOR/Design basis/Block diagram.	
Inverter efficiency	$\geq 90\%$ at rated load	
Overall efficiency	>85%	
Input Harmonics	As per IEEE 519 (Total demand distortion not more than 5.0%)	
Rectifier/Charger		
Input	415 V (+) 10% & (-) 10%, 3P-3W, 50Hz $\pm 5\%$,	
Output voltage/Load	DC	Suitable for SMF-VRLA battery Wattage of Charger shall be designed by considering boost charging of Battery bank @ C/10 capacity & simultaneously taking care of Output load requirements.
Overload Capacity	125% minimum for 10 min 150% minimum for 1 min	
Inrush current	Limited by soft-start circuit	
Output voltage tolerance	+/- 1%	
DC voltage ripple	<1% with battery connected <2 % Without battery connected	
Rectifier	IGBT Based PWM technology with input power factor controlled	
Filter	Input side line filter	
Input current THD (Total Harmonic Distortion) at nominal load	As per IEEE-519 (input Voltage THD<1%, largest single voltage harmonics <3%, Total demand distortion <5%)	

Charging	Automatic Float & Boost charging selection as per battery charging state (voltage level). Facility of Constant Voltage (Adjustable) & constant current(adjustable) boost charging mode @C/10 AH capacity of battery rating shall be designed by Vendor
Bypass Static	
Automatic Bypass	Static bypass to provide an uninterrupted transfer of load in case of failure of any system component or malfunctioning or overload & the load shall return on the UPS when the malfunctioning or overload is cleared.
Voltage/ Freq/Phase	230V \pm 10% AC, 50Hz. \pm 5%, Single Phase 2 wire
Input connection	Separate for each UPS (common mains supply from EB)
The switching time from inverter to bypass & vice versa	No break type
Manual/Maintenance Bypass	Switch/Isolator
Overload on bypass	150% (minimum) for (1 min, 125% (minimum) for 15 min.
Battery Bank	
Type of Battery	12V SMF-VRLA Batteries
Battery Capacity	As per approved design
I. Battery end cell voltage II. Battery stand formation III. Battery backup time	1.75V/cell Suitable MS stand with acid resistant painted. 2Hrs at 100% of UPS rating at 0.8PF (for each Bank). The rectifier/charger output current & voltage shall be limited as per battery manufacturers recommendation.
Alarms, Indications and LCD Display	
Single line power Flow diagram (Mimic diagram) in LCD display to Indicate UPS status (i.e., Main's present, battery charging & discharging, low battery voltage and unit on bypass, unit on Battery etc.,).	
Indications & metering	Digital panel Meter with LCD display shall be provided for monitoring viz. a) Input AC voltage, current, frequency b) Output AC voltage, current, frequency c) Battery Current and voltage d) Mains ON/OFF, Mains Over/under voltage, phase fail e) Inverter ON/OFF, Inverter Over/Under voltage,

	<p>Inverter overload, over heat & load in % on inverter.</p> <p>f) Battery voltage low, battery level in % & battery fault.</p> <p>g) Battery Operation Boost Charge, Float Charge with of status - “in Charge” or “Discharge”</p> <p>h) Load on bypass or inverter.</p> <p>Detailed UPS status with Operation/faults history.</p>
Audible Alarms with LCD Display	<p>a) Mains Failure</p> <p>b) Battery Low</p> <p>c) UPS fault (Continuous)</p> <p>d) Inverter Under-Voltage</p> <p>e) Over Temperature (Continuous)</p> <p>Inverter Overload (continuous)</p>
Communication Interface	RS 485 Modbus Protocol
Protective Features	
Input	Mains Over voltage, under voltage, phase failure
Inverter	Over voltage, short circuit, overload, over temperature
Battery	Under voltage, Battery over charge, Battery Over current
Rectifier & Battery charger	Maximum current limiting, over temp. Trip, Boost charging and float charging current limiting with backup protection against overcharging.
Battery monitoring System	Yes, with communication & provision to interface with SCADA
Provision for Auto/Manual selection	Required for Float and Boost mode operation
Provision for Float/boost mode selection	Required for Float and Boost mode operation

13.2.4 Environmental Conditions:

The uninterrupted power supplies shall be designed and constructed for continuous operation at full load under the climate and environment conditions as described in the specification / Purchaser Data. The UPSs shall be installed in Electrical / Control room buildings and shall be designed for non-air-conditioning ambient.

13.2.5 Components and Conditions:

- The Contractor has to take care that all components and equipment are selected considering easy maintenance, simple and quick diagnosis, and long maintenance intervals. All components and equipment shall be designed for continuous duty at rated load and under the given climate conditions. Standard industrial high-performance systems and components shall be used as far as Possible. Components and equipment of same kind and type shall be selected

for equivalent functions. The interchangeability must be guaranteed.

- b) UPS system shall be free from workmanship defects. Sharp edges, nicks, scratches, burs etc., all fasteners shall be fixed properly. The equipment shall be complete with all parts and all parts shall be functional.

13.2.6 Tagging:

All components, equipment and installations shall receive the respective tagging plates, labels, etc., which have to be of extremely durable material resistant against the environmental conditions. Tagging plates or labels on front of enclosures shall be fixed with screws. For further requirements, reference is made to specification. All wiring inside the UPS shall be neatly arranged & ferruled.

13.2.7 Basic Particulars for Design:

- Suitable for industrial application.
- Microprocessor based online UPS with static bypass.
- The rating of the system shall be as per Schedule of Rates at 0.8 of lagging at ambient specified in design Basis/Data sheet.
- 125% of the rated output for 10 minutes & 150% for 1 minute.
- Rectifier & Inverter switching device shall be IGBT based.
- Dual/Parallel redundant system with automatic static bypass, Battery bank as per data sheet, Schedule of rates and drawing.
- The load shall normally be fed from the inverters.
- Battery shall be suitable to maintain the power supply in the event of mains failure or battery charger failure for time period as indicated in Schedule of Rates/specification.
- Static by pass switch to connect the load to the mains supply, as per the configuration, without interruption to the load in the event of inverter failure.
- Panel illumination to be provided.
- Noise level at a distance of 1mtr. from UPS panels shall not exceed 65dBA.
- All wound elements shall be copper wound.
- Input and output isolation transformers.
- Total Harmonic Distortion (THD) at input shall not greater than 5%.

13.2.8 Permissible Variations:

- 1) UPS input supply from EB source: -

Voltage : +10% & -10% or as per SOR & Frequency +/- 5%

- 2) Output of the uninterrupted power supply system while delivering a load of its rated capacity: -

Voltage: ± 1%, Frequency: ± 0.5%

- 3) Bypass input supply from EB source: -

Voltage : +10% & -10% or as per SOR & Frequency +/- 5%

13.2.9 Protective Features, Indications & Alarms:

1) PROTECTIVE FEATURES:

a) Input-

Mains Over voltage, under voltage, Phase failure

b) Inverter-

Under/Over voltage, short circuit, overload, over temperature

c) Battery-

Under voltage, Battery over charge, Battery Over current, DC Earth Fault

2) INDICATIONS:

Following indication should be provided in front LCD touch screen display panel.

- i. Single line Power Flow Diagram (Mimic diagram) showing status of UPS (i.e.. Main's present, Battery charging & discharging, load on inverter and load on bypass, etc.).

- ii. Digital panel Metering & indications with LCD display (screen touch) shall be provided for monitoring viz.
 - a) Input AC Voltage, current, frequency
 - b) Output AC Voltage, current, frequency
 - c) Battery current and voltage
 - d) Mains ON/OFF, Mains Over/Under voltage, Phase fail.
 - e) Inverter ON/OFF, Inverter Over/Under voltage, Inverter overload, over heat & load in % on inverter.
 - f) Battery Bank voltage low, battery bank level in % & battery bank fail.
 - g) Battery modes of operation status like Float/Boost Charge or discharge with of status - “in charge” or “discharge”
 - h) Load on bypass or inverter.
 - i) Detailed UPS Status with Operation/faults history. (event logging)

3) AUDIBLE ALARMS WITH LCD DISPLAY

- a) Mains Failure
- b) Battery Low
- c) UPS fault (continuous)
- d) Inverter Under-voltage, Over-voltage
- e) Over Temperature(continuous)
- f) Inverter Overload(continuous)

13.2.10 Transformer (Isolation Transformer for Input & Output):

1. Rating suitable for the application & as per IEC726/IS-1171
2. Dry type, with class ‘H’ insulation.
3. Input and output isolation transformers shall be provided for galvanic
4. isolation. (As per block diagram).

13.2.11 Rectifier / Battery Charger:

1. Primary input circuit breakers (MCCB) to feed rectifier.
2. The circuit should be latest proven IGBT based fully microprocessor controlled with PWM Technology.
3. The rectifier input must be active power factor controlled and value as specified.
4. Transient and surge protection circuit in input circuit to protect UPS from surges and Voltages Spikes.
5. Charger size shall be based on the maximum inverter input load current and recharging current (in maximum time of 10 hours after discharge). The rating of rectifier / charger shall be not less than the value calculated as follows:

For SMF-VRLA batteries = Inverter input current (Idc) + 0.1Ah (10 hr. rating of battery)

Were,

**Inverter input current during charging (idc) = Rated kVA capacity of UPS X load
p.f X 1.1 (overload)**

Inverter eff. X (No. of cells x
Float Cell voltage)

**Maximum Inverter Input current(idc) = Rated kVA capacity of UPS X load p.f
Inverter eff. X (No. of cells x End Cell voltage)**

Charger Sizing = Charger Current X Charger Voltage (No. of cells x float voltage of cell)
Rectifier efficiency x input PF

6. Necessary smoothing reactor and filters.
7. Automatic boost and float charging control.
8. Protective features
 - Maximum current limiting
 - Over temp., Trip
 - Boost charging and float charging current limiting with back up protection against overcharging.
9. Charger shall simultaneously supply entire power necessary for inverter (load) and to keep the battery of required capacity in fully charged condition. Provision for automatic charging in both float and boost shall be made.

13.2.12 Inverter (IGBT Technology Based):

1. Input circuit consisting of battery MCCB, battery filter and smoothing reactor.
2. DC/DC converter for voltage control, if required.
3. The circuit should be IGBT based fully microprocessor controlled with PWM Technology.
4. Control & protection electronics.
5. Series reactor and parallel filter.
6. Output isolation transformer.
7. Protection against the following.

- Abnormal output voltage
- Abnormal DC link voltage.
- Over load trip.
- Low battery voltage protection
- Transformer Over temperature.

13.2.13 Static Bypass Switch:

1. Static switch automatically switches the load to the reserve power supply/mains whenever there is failure in inverter supply to the load.
2. Automatic Bypass-static to provide uninterrupted transfer of load in case of any system component or malfunctioning and shall return the load automatically to the UPS when malfunctioning & overload is cleared.
3. The switching time from inverter to bypass & vice versa shall be no break type in synchronized condition.
4. Transfer/Retransfer facility shall be provided in both Auto & Manual mode.
5. Manual bypass switch/isolator shall be provided which allows the electrical isolation of UPS from load for the purpose of maintenance of UPS without disturbance to load.
6. High-Speed fuses shall be provided for protecting the SCRs against accidental overload.
7. Inverter should be phase locked to the bypass AC supply as long as bypass remains within specified frequency range. The frequency should be site adjustable in steps of $\pm 1\text{Hz}$.

13.2.14 Constructional Features:

1. Unitized construction and shall be manufactured as per IEC:62040, IEC60950
2. Free standing, floor mounted, indoor type and complete with all interconnection.
3. Dust and vermin proof, Sheet steel clad, Minimum 2.5mm thick for load bearing parts, 1.6mm for doors and covers.
4. Units shall be self-contained and serviceable.
5. The arrangement and layout shall facilitate easy and convenient supervision of the unit while running as well as quick detection of disturbances and troubleshooting.
6. Copper earth bus bar shall run throughout the length of Panels. All doors & non-current carrying metallic parts shall be suitably earthed.

13.2.15 Enclosure and Ventilation:

- Enclosure conforming to minimum IP-42 class.

- Units shall be provided with cooling fans.

13.2.16 Battery unit:

Ampere-hour capacity of the battery shall be selected on the following basis:

- a) Load Power factor of 0.8
- b) **Backup time of minimum 2Hrs.**
- c) Nominal of battery bank voltage: **as per approved design**

The scope also involves supply, installation and commissioning of Battery Banks SMF-VRLA battery modules along with battery stands, terminal connections and cabling from UPS to battery banks. Each UPS will have Separate Battery Bank capable of delivering backup time as per specification at full load at 0.8 power factor. Battery sizing calculation to be submitted along with the bid.

Important Note- Type and Voltage of Batteries shall be as per approved design during the approval stage.

Stationery batteries of type as per data sheet/specification complete with all required accessories as applicable including but not limited to the following shall be supplied with each battery set.

- a) Battery stands shall be as per battery manufacturer's standard shall be provided.
- b) Cell testing voltmeter complete with leads - (1 no. Per set).
- c) Spanner – (1 no. Per set).
- d) Battery isolation unit in sheet steel enclosure shall be provided near to each battery bank.

13.2.17 Drawing and Documents:

The following documents shall be submitted:

- a) data sheets
- b) GA & SLD showing major components / configuration.
- c) List of recommended spares.

The following calculations / dimensions shall be submitted for approval:

- d) Battery sizing calculation.
- e) Battery bank GA/stand size.
- f) UPS panel size.

The following drawings shall be submitted for approval

- g) G.A of UPS system including dimensions.
- h) Battery bank GA including dimensions.
- i) Major Bill of Material.
- j) Charger sizing calculation.
- k) Battery sizing calculation.
- l) Schematic & Wiring diagram for reference.
- m) UPS Control & Protection philosophy.
- n) List of LCD indication & audio alarms.

Final drawings, operation & maintenance manual and erection instructions to be submitted along with dispatch of equipment's in 2Sets in hard copy & 2 sets in soft copy (CD).

13.2.18 Inspection:

Inspection and testing of equipment's shall be carried out by BARC/ BARC nominated inspection agency at the Manufacturer's works prior to dispatch on final product to ensure conformity of the same with acceptable criteria of technical specifications, approved drawings and national/international standards. The Inspection for UPS Systems, Rectifiers & Battery Banks shall be 100%.

The Contractor shall submit Quality Assurance plan (QAP) for respective equipment's QAP shall be prepared and furnished by the contractor along with their internal in process quality checks to BARC.

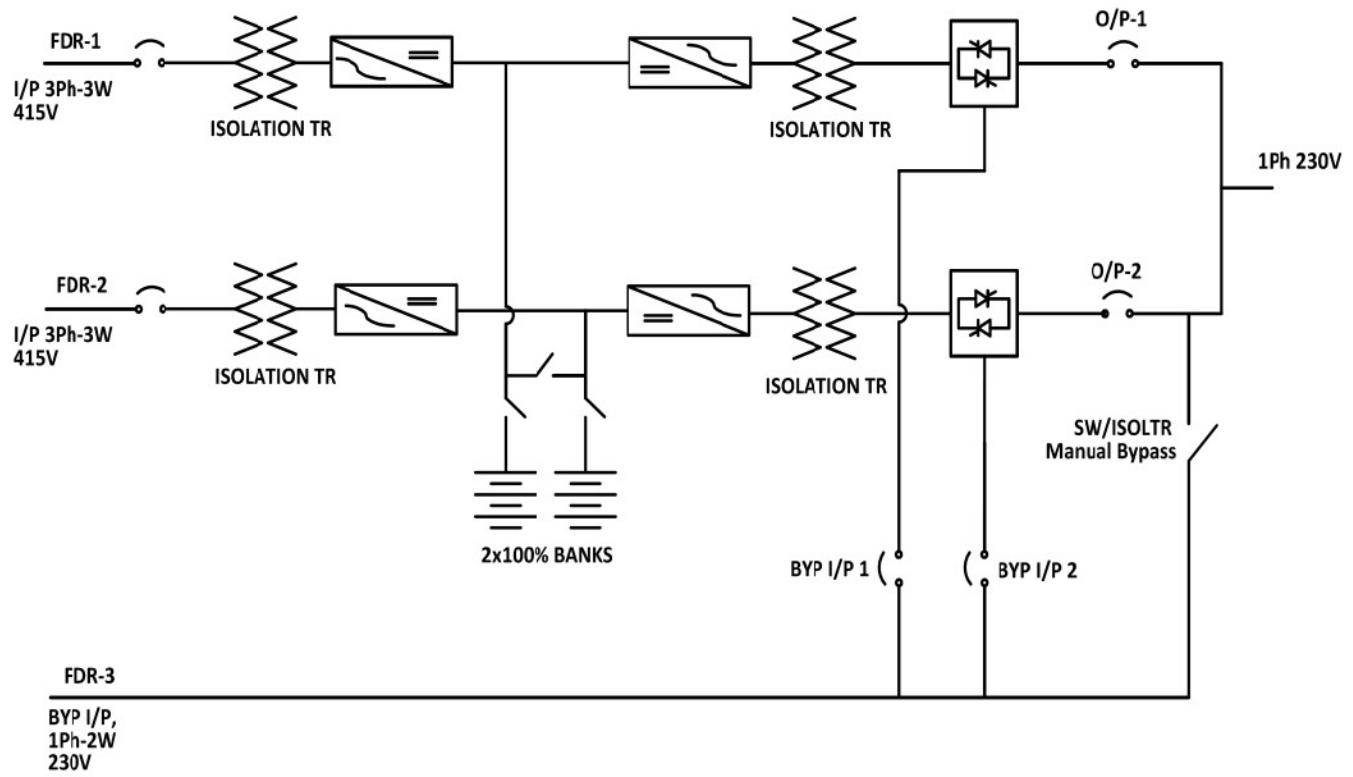
Final acceptance testing along with the batteries shall be done at site. Site acceptance test procedure shall be submitted by the contractor along with QAP.

13.2.19 Spares to be supplied with UPS:

Contractor shall supply following Spares without any extra cost for both UPS together.

- i. For 20kVA, 50kVA – 1 No's of UPS cards for each kVA.
- ii. 2 No's of additional batteries for each kVA rating.

13.2.20 SLD:



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