OWNER:

THE TATA POWER COMPANY LIMITED

TITLE OF WORK TO BE AWARDED:

REPLACEMENT OF 11 KV SWITCHGEAR PANELS FOR BHIRA PUMP STORAGE UNIT (BPSU) AND OLD POWER HOUSE (OPH) AT BHIRA

ENQUIRY REFERENCE NO.: CC27FK004

NOTICE INVITING EXPRESSION OF INTEREST (EOI) FOR

REPLACEMENT OF 11 KV SWITCHGEAR PANELS FOR BHIRA PUMP STORAGE UNIT (BPSU) AND OLD POWER HOUSE (OPH) AT BHIRA

Enquiry reference no.: CC27FK004
Title of Work: Replacement of 11 kV switchgear panels for Bhira Pump Storage Unit (BPSU) and Old Power House (OPH) at Bhira
Type of Bidding: E-tendering (through Ariba online portal) / Two Part (Technical and Price bids under separate envelopes)
Contact Details: All communication including EOI submission shall be addressed to following officer/s: Mr. Faizan Khatri Email: faizan.khatri@tatapower.com Copy of all communications shall be marked to (Cc): Mr. P Ramrayka / Mr. Ravi Shingare Email: p.ramrayka@tatapower.com / ravi.shingare@tatapower.com

The Tata Power Company Limited ("Owner") invites Expression of Interest (EOI) from interested parties for the Two-Part e-Tendering Process of following Relevant Work Package:

Table 1

Package Description	Tender Fee	Bid Security	Estimated Package Value
Replacement of 11 kV switchgear panels for Bhira Pump Storage Unit (BPSU) and Old Power House (OPH) at Bhira	INR 2000/- (INR Two Thousand Only) *To be submitted along with EOI. (Non-refundable tender participation fee)*	INR 4,00,000/- (INR Four Lakhs only). *Bid Security to be submitted as a Guarantee/ DD/ NEFT at the BID stage (and not with EOI)*	Rs. 5 Cr. (Indian Rupee Five Crore)

1. INTRODUCTION:

The Tata Power Company Limited (TPC) is among the largest private sector Power Utility companies in India with presence in Generation, Transmission and Distribution of Power through conventional and renewable sources.

The tendering/procurement activities for this Package are being managed from Tata Power's following office:

Smart Center of Procurement Excellence (SCOPE),
Corporate Contracts,
The Tata Power Company Limited,
3rd Floor, Sahar Receiving Station, Near Hotel Leela,
Sahar Airport Road, Andheri East, Mumbai – 400 059.
Maharashtra, India.

2. SCOPE OF WORK:

Replacement of 11 kV switchgear panels for Bhira Pump Storage Unit (BPSU) and Old Power House (OPH) at Bhira.

Detailed Scope of Work shall be as per the below Annexure A.

3. TENDER FEE & TIMELINES:

a) Interested parties meeting the "Bidder Pre-Qualification Requirements" specified under point no. 4 in this document can request tender document and participate in the bidding process by submitting the Expression of Interest (EOI) Letter along with the Tender Fee Payment Details to the contact details mentioned below not later than deadline specified below. Request for extension of EOI submission date will be not entertained.

b) **Interested bidders should submit the Expression of Interest by filling complete details in the Microsoft Forms available at:**

https://forms.office.com/r/NJ4BrsLfLS

EOI / requests without complete information and communication as above within deadline shall be liable to be rejected and will not be considered further.

c) Tender Fee, as indicated in the Table1 above may be paid through **NEFT/RTGS** as per details for payment of Tender Fee given in Table2 below:

Table 2

Details for payment of Tender Fee:	
Bank details for submitting Tender fees through bank transfer / NEFT:	**Beneficiary Name:** The Tata Power Company Limited **Bank Name:** HDFC Bank **A/c no:** 00600110000763 **IFS Code:** HDFC0000060 **A/c type:** CC **Branch Name & Address:** HDFC Bank, Maneckji Wadia Building, Nanik Motwani Marg, Fort, Mumbai 400023

Deadline for tender fee payment and submission of EOI:	**7th April 2026, CoB.**

d) Expression of Interest letter to be submitted along with tender fee payment details should include the following details:

- A covering letter duly stamped and signed by an authorized signatory clearly indicating the Tender Reference number and your EOI to participate in the tendering process.
- Tender fee payment details / reference no (ensure that tender fee is received by us within specified deadline)
- Bidder to indicate authorized person name, contact number and e-mail id (mandatory) of the person to whom RFQ / tender and all other communications to be addressed for this tender.

e) Detailed Bid Document (also referred as RFQ) shall be issued through Tata Power e-tender portal (Ariba System) only to the parties submitting a valid EOI as per terms mentioned in this document.

4. BIDDER PRE-QUALIFICATION REQUIREMENTS:

Interested parties to note that Bidder shall be required to fulfill the following bidder pre-qualification requirement / criteria to qualify for the subject work. Bidder will be required to submit relevant supporting documents to demonstrate their qualification during the bid submission stage against Tender document / RFQ and bidders not found meeting the pre-qualification requirements given below will be disqualified from the tender.

4.1 TECHNICAL REQUIREMENT:

Sr No	Parameter	Qualification Requirement	Documents to be submitted by bidder to ascertain meeting of Pre-Qualification Requirement
1	**Infrastructure**	Bidder must be an OEM of MV AIS system (with Generator Circuit Breaker application) approved by Tata Power with manufacturing facility/assembly in India. Make of MV AIS offered during Tender evaluation stage shall not be changed post award. The bidder must have in-house routine and	Self-undertaking to be submitted in this regard. Tata Power reserves the right to inspect the said manufacturing facility as a proof of compliance to this parameter.

		acceptance testing facilities for acceptance as per relevant IS/IEC.	
2	**EPC Experience**	Bidder shall have completed EPC commissioning of 5 AIS stations (6.6kV and above, with Generator Circuit Breaker application) with all associated balance of electrical and mechanical systems in last 10 years out of which at least 01 no. shall be in satisfactory commercial operation since last 02 years (from the date of bid submission). In case the bidder has a previous association with any of Tata Group companies for similar products and services, the performance feedback for that bidder by Tata Power shall only be considered irrespective of performance certificates issued by any third organization. Indian subsidiaries of global companies having plant in India are also eligible to bid if the qualification requirements stated above are met independently or in combination with the parent company. Declaration from parent company needs to be submitted.	a) Supply List, purchase orders & Performance Certificates from the utilities / clients b) Self-undertaking to be submitted in this regard. TATA Power reserves the right to inspect the said commissioned facility as a proof of compliance to this parameter.
3	**Compliance to QAI requirement**	Acceptance of minimum quality requirements defined in technical specifications including SQP & FQP.	Bidder to confirm.
4	**Type Test for MV AIS**	Bidder shall offer MV AIS in this project which is successfully type tested (as per IEC or equivalent Standard). Type test reports of offered design, manufactured either in Indian facilities or in parent facilities are acceptable. The type test certificate of the MV AIS shall not be more than 5 years old as on the scheduled date of BID opening. Time period for type test may be extended by another 5 years as a special case, if there is no change in design/material of construction (MOC).	1. Type test reports. 2. List of type tests carried out. 3. All type test reports of offered MV AIS design, manufactured either in Indian facility or in parent facility. 4. Undertaking that there is no change in design / Material of Construction (MOC) if Type Test Report older than 5 years but less than 10 years prior to date of bid opening has to be

			considered (if applicable). 5. Undertaking that type test shall be carried out for the offered equipment / material from NABL / International Accredited Lab without any cost implication to the owner and the Type Test reports shall be submitted before dispatch of the equipment / material, in case type test reports furnished are not for the quoted equipment / material but for the equipment / material with higher voltage class and/or different capacity (if applicable).

It may be noted that the above requirements are minimum qualification criteria. However, Tata Power reserves its right to further assess the capabilities of the parties and reserves its rights to further shortlist, accept or reject any party without assigning any reason.

FINANCIAL REQUIREMENT:

Bidder / Tenderer should have minimum Average Annual Turn-over of Rs. 10 Crore (Indian Rupees Ten Crore) during the last three financial years **(Attach CA Certified P&L statement consisting UDIN Number)**

It may be noted that the above requirements are minimum qualification criteria. However, Tata Power reserves its right to further assess the capabilities of the parties and reserves its rights to further shortlist, accept or reject any party without assigning any reason. The tender may be split in more than one parties at the discretion of Owner. Consortiums are not permitted and bidder shall have to meet the PQR in individual entity basis only.

5. BID SECURITY / EMD:

Interested parties to note that Bidder will be required to furnish a Bid Security along with their Bid, in the format prescribed in Bid Document **in the form of Bank Guarantee or through RTGS or Demand Draft**, for an amount as defined in the covering page of this notice document. Bids not accompanied by an acceptable Bid Security shall be rejected by the Owner as being non-responsive and returned to the bidder without being opened.

Interested parties to note that Bid Security is not required with the EOI and it is required to be submitted with the Bid only during Bid Submission stage once RFQ is released to the interested parties that have submitted a valid EOI.

6. BIDDING PROCESS:

Detailed Bid Document (also referred as RFQ) shall be issued through Tata Power e-tender portal (Ariba System) only to the parties that submitted a valid EOI as per terms mentioned in this document.

Bidder to note that commercials for subject tender may be conducted through e-auction. Detailed bidding and auction process shall be detailed in the RFQ / tender document.

PROJECT ID: TE00606 SPEC NO: TE/SP/0039/FY26 Rev: A Date:10-12-2026	TECHNICAL SPECIFICATIONS Specification for replacement of 11kV AIS AT Bhira PH-2, 7 and BPSU unit	Section-A Page 1 of 37

Technical Specification

SPECIFICATIONS FOR New 11kV AIS AT Bhira PH-2, 5 and BPSU

TE00606

Specification Title: Specification for replacement of 11kV AIS AT Bhira PH-2, 5 and BPSU unit.

Specification No: TE00606/SP/0039/FY26

TATA POWER
The Tata Power Company Limited
Engineering T&D, Antophill Receiving Station, Samadhan Road, Antophill,
Mumbai 400 037.

Registered Office: Bombay House 24 Homi Mody Street Mumbai 400 001

Revision	Date	Description	Approvals		
			Prepared By	Checked By	Approved By
A	10-02-2026	Issued For Review & Comment	SR	VAS/UP	SKV 040326

CHECK LIST FOR DOCUMENTS TO BE SUBMITTED ALONG WITH THE BID

Sr. No.	Document Name	Submitted by Bidder (Please ☑ in the Box)			
1.	Signed copy of bid document as a token of acceptance	YES		NO	
2.	Duly filled in schedules, listed in section 'C'. i.e. Schedule C1 to C9 in excel format	YES		NO	
3.	Qualifying Requirement in Format E1 in excel format	YES		NO	
4.	Quality Assurance Plan (QAP), Manufacturing Quality Plan (MQP), Field Quality Plan (FQP) as applicable	YES		NO	
5.	General Arrangement Drawings for equipment offered	YES		NO	
6.	Filled up Data Sheets for 11kV AIS & CRP	YES		NO	
7.	Type Test Reports as applicable.	YES		NO	
8.	Project Schedule.	YES		NO	

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SECTION - A

PROJECT SPECIFICATIONS

A1 INTENT OF SPECIFICATION:

Tata Power Company Limited (Tata Power) hereinafter called the "OWNER" or "PURCHASER", proposes to replace existing 11kV AIS at Tata Power Bhira for Generating unit no. 2, 5 and Bhira Pump storage plant in Maharashtra, India, as it has completed the usable service life of 25 years.

It is mandatory for bidder to submit all documents mentioned in Mandatory checklist of section-A of page-2 without which the technical bid may be considered incomplete and stand cancelled.

1. New bus sections of 12 kV class (to be operated at 11kV level) are to be installed along with bay control at the same location of existing 11kV switchgears (existing Protection IED available in separate Protection panel shall be used). The Switchgear Breaker is used for synchronizing the Hydro Generators with Grid. Hence, breaker offered with Switchgear shall have the capability to operate as Generator Circuit Breaker. As this is replacement of existing switchgear, new switchgear shall be in line with existing switchgear. It's bidders responsibility to study complete existing switchgear (includes GA, size, cable connection or bus-duct connection requirement, scheme, remote protection & control Panel arrangement etc.) and incorporate all features of existing switchgear in new 11kV switchgear.

2. The specifications cover detailed scope for design, engineering, manufacture, factory inspection, packing, route survey, transport with transit insurance, delivery to site in good condition, storage & handling at site, erection, testing, commissioning, electrical inspectors'/statutory approvals, handover to owner all equipment's and systems with specified warranties for 11kV AIS & Standalone CRP mentioned in the specifications required for the system as per latest CEA technical standards for construction of electrical plants and sub-stations. Existing layouts shall be provided to the Bidder.

A2 PROJECT INFORMATION:

1.0	Owner	The Tata Power Company Limited
2.0	Consultant	Nil
3.0	Location of site	Tata Power Bhira Generating Station, Dist. Raigad, Maharashtra.
4.0	Nearest Rail head	Site is connected by road.
5.0	Transport	Access roads are available for movement of materials to site. Movement of heavy

		materials would be through existing roads up to site.
6.0	Plant Elevation	Generally, about 100 m above mean sea level.
7.0	Climatic conditions	
7.1	Temperatures:	
	(a) Maximum dry bulb temperature	36.7^0 C
	(b) Minimum dry bulb temperature	18.3^0 C
	(c) Design temperature for electrical equipment / devices	50^0C
	(d) Design humidity	95%
7.2	Relative humidity	
	(a) Maximum during monsoon	100%
	(b) Minimum during December to January	22%
8.0	Rainfall	Annual average rainfall is about 6000 mm (most of which occurs during the monsoon season from June to September)
9.0	Wind data	
	Calculations for wind effect shall be in accordance with IS: 875 (Part-3) taking into account the following:	
	(i) Basic wind speed = 44 m/sec	
	(ii) Factor K1, K2, K3 = as per IS 875 Part-3	
	(iii) Category of terrain = as per IS 875	
10.0	Seismic conditions	The proposed site is located in seismic zone III as per the Indian Standard IS 1893 and importance factor of 1.75.
11.0	Air Quality	Atmosphere polluted with industrial gases and wastes because of proximity to

		petroleum refineries and fertilizer complex.
12.0	Sea water temperature	
	(a) Maximum	36.7^0 C
	(b) Minimum	22.8^0 C
	(c) Average	29.8^0 C
13.0	Auxiliary Power Supply:	220V DC
a	AC Power Supply System for Station Auxiliaries.	415V AC, 3-phase, 4-wire solidly grounded system.
b	AC Power Supply System for Lighting fixtures and space Heaters.	240V, 1 phase, 2 wire, 50Hz AC supply with neutral lead grounded derived from (a).
c	Uninterrupted Power Supply.	240 V, 1-phase, 50 Hz, 2-wire, AC Supply.
d	Construction Power Supply	415V, 3 phase, 4 wire, 50Hz AC supply solidly grounded.
e	DC Power Supply system for control devices.	220V DC
f	DC Power Supply system for communication (Positive grounded).	48V DC
g	DC Power Supply system for SCADA (Ungrounded).	48V DC
h	The above voltages may vary as follows: All devices shall be suitable for continuous operation over the entire range of voltage and frequency indicated below without any change in their performance. AC supply Voltage variation ± 10% Frequency variation ± 5% Combined voltage & frequency variation 10%.	
i	Construction Power supply will be made available at site.	

A.2.1 Design System Parameters:

The equipment and system shall be designed to meet the following major Technical Parameters as brought out hereunder.

SR No	Description of Parameters	Parameter for 11kV switchgear
1.	Nominal voltage of a system (Un)	11 kV
2.	Highest voltage of a system (Us)	12 kV

3.	Rated frequency (Hz)	50 Hz
4.	No of Phase	3
5.	Rated Insulation Levels Full wave impulse withstand voltage (1.2/50 micro sec)	75 kVp (Ph-E & Ph-Ph). 85 kVp across Isolating Distance.
6.	One-minute power frequency dry and wet withstand voltage (RMS)	28 kV (Ph-E & Ph-Ph). 32kV across Isolating Distance.
7.	Minimum creepage distance	31 mm/kV
8.	Rated Short circuit current Capacity	25 kA for 3 Sec
9.	System Neutral Earthing	Un-Grounded.

A3. SCOPE OF WORK

A.3.1 For 11kV Switchgear:

A.3.1.1 This specification issued for placing a Purchase order with successful bidder for required no. of 11kV AIS panels as indicated in table No.1, 2, 3, 4 and Stand alone Relay, control, metering panel as indicated in Table No. 5. Also refer SECTION E Annexure for existing SLD and drawings.

A.3.1.2 Scope includes supply, installation, testing & Commissioning of 11kV Switchgear & Stand alone control, protection & Metering Panel.

A.3.1.3 As this is replacement of existing switchgear, new switchgear shall be in line with existing switchgear. It is bidders' responsibility to study complete existing switchgear (includes GA, size, cable connection and/or bus-duct connection requirement, scheme etc.) and incorporate all features of existing switchgear in new 11kV switchgear.

Table-1: 11kV, 630A, Copper Bus, 25kA for 3 sec, 3Ph, 50 Hz, BPSU switchgear:

SR. NO.	TYPE OF FDR	BKR RATING	FEEDER NAME	Quantity	Type of cable/ Busduct connection
1.	Incomer-off load isolator	1250A	Off-load isolator (Incomer)	1 no.	3 runs x 1C x 185Sq.mm Copper XLPE
2.	Bus PT (with Open delta Protection Relay)	11000V/√3 - 110V/√3/110V/√3 100VA- CI-0.2S 75VA- CL 3P	Bus PT-1	1 no.	
3.	Surge arrester (3-Ph)	10kA, Class-3	SA-1	1 no.	

4.	Outgoing feeder with Surge Arrestor for Unit Auxiliary Transformer along with PT **PT:** (with Phase - phase PT for VPIS, U/V & O/V alarm) 11000V/√3/110V/√3/110V/√3 100VA- Cl-0.2S 75VA- CL 3P **CT - 1: (1 phase)** 200/5A; 20VA Cl. 0.2S **CT - 2: (3 phase)** 1000/5A, 20VA 5P20	1250A	Outgoing	1 no.	3X 1CX 185Sq.mmX XLPE
5.	Outgoing feeder with Surge Arrestor for Excitation Transformer along with PT **PT:** (with Phase - phase PT for VPIS, U/V & O/V alarm) 11000V/√3/110V/√3/110V/√3 100VA- Cl-0.2S 75VA- CL 3P **CT – 1 (1 phase):** 200/5A; 20VA Cl. 0.2S **CT – 2 (3 phase):** 1000/5A, 20VA 5P20	1250A	Outgoing	1 no.	3X 1CX 185Sq.mmX XLPE

Table-2: 11kV, 630A, Cu. Bus 25kA for 3 sec, 3Ph, 50 Hz, BPSU ICOG switchgear:

SR. NO.	TYPE OF FDR	BKR RATING	FEEDER NAME	Quantity	Type of cable/ Busduct connection
1.	Incoming – (From Old Power house). (Additional Cable cubicle required for Back2Back Cable connections for cable coming from OPH)	1250A	Off-load isolator (Incomer)	1 no.	3X 1CX 185Sq.mmX XLPE
2.	Line PT (3 Phase) With open Delta Protection Relay	11000 V/√3/110V/√3/110V /√3 100VA- CI-0.2S 100VA- CL 3P	Bus PT-1	1 set.	
3.	Outgoing with Surge Arrestor: (to Station Transformer along with Ph-Ph PT: 11000/√3/110V/√3/110V/ √3 100VA- CI-0.2S 75VA- CL 3P). **CT: 1 (1 phase)** 200/5A, 20VA, 0.2S **CT: 2 (3 phase)** 2000/5A, 20VA 5P20	1250 A	Outgoing	1 no.	3X 1CX 185Sq.mmX XLPE

Table-3: 11kV, 2000A, Cu. Bus 25kA for 3 sec, 3Ph, 50 Hz, PH#2 switchgear:

SR. NO.	TYPE OF FDR	BKR RATING	FEEDER NAME	Qty.	Type of cable/ Busduct connection
1.	**Incomer # 1- From Generator #2 Cubicle- (Consists of following separate panels).**				
1.1	Generator Incomer **With Line PT** 11000V/√3/110V/√3/110V/√3 100VA- CI-0.2S	2500A	Incomer-1	1 no.	

	75VA- CL 3P **CT –** 2000/5A-5A; 5P20 25VA & 0.2S Class				
1.2	Generator surge cubicle (Shall have 3 Single Phase **PT -** 11000V/√3/110V/√3/110V/√3 100VA- Cl-0.2S 75VA- CL 3P)	As per existing GA-Please refer Panel-1A drawings in Annexure-1		1 no.	
1.3	Generator surge cubicle (Provision for termination of Excitation Transformer cable of size 3Cx185 Sq.mm 1 Run).	As per existing GA-Please refer Panel-1B drawings in Annexure-1		1 no.	
1.4	Generator cable compartment [**With CT** 2000/5A-5A-5A (2 core PS Class & 1 Core 5P20, 25VA)]	As per existing GA		1 no.	9x1Cx630 Sq. mm. XLPE Cable (per phase 3 Runs)
	Dummy Panel				
2.	Disconnector to 30MVA Generator Transformer. (**With CT –** 2000/5A-5A: 25VA 5P20 & PS Class)	2500A	Off-load isolator (Incomer)	1 no.	Bus-duct (bottom entry). SPBD Cubicle size 360x580 mm with copper Bus Bar of 3x100x6mm
3.	Bus PT (3 no. Single Phase) With open Delta Protection Relay.	11000V/√3/110V/√3/110V/√3 100VA- Cl-0.2S 75VA- CL 3P	Bus PT-1	1 no.	
4.	Bus PT (Ph-Ph)	11000V/√3/110V/√3/110V/√3 100VA- Cl-0.2S 75VA- CL 3P	Bus PT-2	1 no.	
5.	Surge arrester for Generator Surge Cubicles. (3-Ph)	10kA, Class-3	SA-1	1 no.	
6.	Outgoing feeder - Station Transformer # 1. (with Surge Arrestor). **PT:** (with Phase - phase PT for VPIS, U/V & O/V alarm) 11000V/√3/110V/√3/110V/√3 100VA- Cl-0.2S 75VA- CL 3P	1250 A	Outgoing	1 no.	1RUN OF 3C X 300SQMM

	CT - 1: 100-200/5/5A; 25VA Cl. 0.2S **CT - 2 & 3:** 2000/5-5A, 25VA 5P20 & PS				
7.	Outgoing feeder – 3 MVA Distribution Transformer. (with Surge Arrestor). **PT:** (with Phase - phase PT for VPIS, U/V & O/V alarm) 11000V/√3/110V/√3/110V/√3 100VA- Cl-0.2S 75VA- CL 3P **CT - 1:** 200-300/5/5A; 25VA Cl. 0.2S **CT - 2 & 3:** 2000/5-5A, 25VA 5P20 & PS	1250A	Outgoing	1 no.	1RUN OF 3C X 300SQMM
8.	Outgoing Feeder-PSU station Trafo. (with Surge Arrestor). **PT:** (with Phase - phase PT for VPIS, U/V & O/V alarm) 11000V/√3/110V/√3/110V/√3 100VA- Cl-0.2S 75VA- CL 3P **CT - 1:** 100-200/5/5A; 25VA Cl. 0.2S **CT - 2 & 3:** 2000/5-5A, 25VA 5P20 & PS	1250A	Outgoing	1 no.	2 Runs of 3X1CX 185Sq.mm X XLPE

Table-4: 11kV, 2000A, Cu. Bus 25kA for 3 sec, 3Ph, 50 Hz, PH # 5 switchgear:

SR. NO.	TYPE OF FDR	BKR RATING	FEEDER NAME	Qty.	Type of cable/ Busduct connection
1.	**Incomer-1-From Generator #5 Cubicle - Consist of following separate panels:**				
1.1	Generator Incomer	2500A	Incomer-1	1 no.	

	With Line PT 11000V/√3/110V/√3/110V/√3 100VA- Cl-0.2S 75VA- CL 3P **CT –** 2000/5A-5A; 5P20 25VA & 0.2S Class.				
1.2	Generator surge cubicle (Shall have 3 Single Phase **PT -** 11000V/√3/110V/√3/110V/√3 100VA- Cl-0.2S 75VA- CL 3P)	As per existing GA-Please refer Panel-1A drawings in Annexure-1		1 no.	
1.3	Generator surge cubicle (Provision for termination of Excitation Transformer cable of size 3Cx185 Sq.mm 1 Run).	As per existing GA-Please refer Panel-1B drawings in Annexure-1		1 no.	
1.4	Generator cable compartment [**With CT** 2000/5A-5A-5A (2 core PS Class & 1 Core 5P20, 25VA)]	As per existing GA		1 no.	9x1Cx630 Sq. mm. XLPE Cable (per phase 3 Runs)
	Dummy Panel				
2.	Disconnector to 30MVA Generator Transformer. (**With CT –** 2000/5A-5A: 25VA 5P20 & PS Class)	2500A	Off-load isolator (Incomer)	1 no.	Bus-duct (bottom entry). SPBD Cubicle size 360x580 mm with copper Bus Bar of 3x100x6mm
3.	Bus PT (3 no. Single Phase) With open Delta Protection Relay.	11000V/√3/110V/√3/110V/√3 100VA- Cl-0.2S 75VA- CL 3P	Bus PT-1	1 no.	
4.	Bus PT (Ph-Ph)	11000V/√3/110V/√3/110V/√3 100VA- Cl-0.2S 75VA- CL 3P	Bus PT-2	1 no.	
5.	Surge arrester for Generator Surge Cubicles. (3-Ph)	10kA, Class-3	SA-1	1 no.	
6.	Outgoing feeder - Station Transformer # 1. (with Surge Arrestor). **PT:** (with Phase - phase PT for VPIS, U/V & O/V alarm)	1250 A	Outgoing	1 no.	1RUN OF 3C X 300SQMM

	11000V/√3/110V/√3/110V/√3 100VA- Cl-0.2S 75VA- CL 3P **CT - 1:** 100-200/5/5A; 25VA Cl. 0.2S **CT - 2 & 3:** 2000/5-5A, 25VA 5P20 & PS				
7.	Outgoing feeder – 3 MVA Distribution Transformer. (with Surge Arrestor). **PT:** (with Phase - phase PT for VPIS, U/V & O/V alarm) 11000V/√3/110V/√3/110V/√3 100VA- Cl-0.2S 75VA- CL 3P **CT - 1:** 200-300/5/5A; 25VA Cl. 0.2S **CT - 2 & 3:** 2000/5-5A, 25VA 5P20 & PS	1250A	Outgoing	1 no.	1RUN OF 3C X 300SQMM
8.	Outgoing Feeder- PSU station Trafo. (with Surge Arrestor). **PT:** (with Phase - phase PT for VPIS, U/V & O/V alarm) 11000V/√3/110V/√3/110V/√3 100VA- Cl-0.2S 75VA- CL 3P **CT - 1:** 100-200/5/5A; 25VA Cl. 0.2S **CT - 2 & 3:** 2000/5-5A, 25VA 5P20 & PS	1250A	Outgoing	1 no.	2 Runs of 3X1CX 185Sq.mm X XLPE

Table - 5: Stand alone CRP for BPSU Switchgear:

Sr. no.	Description	Dimension	Remarks
1	Common Protection & Control Panel for 11kV Switchgear indicated in Table 1 & Table 2 above	Shall House Control Switches, Numerical Relays, BCPU, Metering, Auxiliary Relays, Annunciation, indication & SAS connectivity as required.	

A.3.1.4 In addition to section - A, it is mandatory bidder to comply with Complete scope of work shall be as per section-B, C, D and E.

A.3.1.5 Bidder shall ensure to incorporate all control scheme interlock and logic as per existing scheme in new switchgear. Control voltage for complete scheme will be 220V DC.

A.3.1.6 Bidder to consider quantity and details of CTs as per existing CTs for each outgoing feeder.

A.3.1.7 Bidder shall also consider open-Delta protection in Bus PT cubicle for all Switchgear.

A.3.1.8 The switchgear shall be installed at the same location of existing 11kV AIS. Hence, bidder shall install and commission as per project requirement.

A.3.1.9 Bidder to provide flexible copper tin plated jumpers between Bus Duct & Switchgear.

A.3.1.10 The switchgear shall be delivered at site in the form of individual panels packaging and not as coupled panels. Maximum transport dimensions shall not exceed LxW: 1000 x 2000 mm. Bidder must perform route survey and ensure safe delivery of panels at site.

A.3.1.11 Bidder shall not consider Earth switch for the outgoing feeders.

A.3.1.12 Along with switchgear bidder to consider shorting trolley (shall be suitable to use in-place of GCB) which is required for the Generator Short Circuit test.

A.3.1.13 In existing system for U#2 & U#5, the protection relays and metering system are provided in a separate panel installed in the control room. Hence bidder shall exclude main BCPU and metering system from scope of work. Existing protection and metering system will continue with the same arrangement.

A.3.1.14 For BPSU switchgear (Panels mentioned in Table No-1 and 2) bidder to consider control cable entry from Top & Bottom side. Control cable entry for Rest of the switchgear shall be from bottom side.

A.3.1.15 For BPSU Switchgear (Table -1 and Table-2) , Bidder to provide Remote standalone Panel for Protection, Metering & Controls for protection & operation of Excitation Transformer, ST & UAT distribution transformer feeders. Bidder shall also provide 3 no. Energy meters which shall be capable of integration with secure E watch server.

A.3.1.16 Rating of Generator Surge capacitor indicated in Table-3 (Sr. no. 1.2 and 1.3) and Table-4 (Sr. no. 1.2 and 1.3) are as below:

A.3.1.17 In Generator Incomer Panel, disconnecting link shall be provided between cable termination and Bus Bar / Surge cubicle. Provision is required for Isolation of Generator from Surge cubicle for testing purpose.

A.3.1.18 MV Cables & termination are not in scope of the bidder. However, necessary mechanical support arrangement inside cable termination compartment shall be provided.

A.3.1.19 Bidder scope includes Design Engineering, Manufacturing, testing at factory, packing, transportation to site, site receipt, storage, shipment to location for installation, site installation, testing prior to commissioning, Commissioning & Handing over.

A.3.1.20 Bidder shall also arrange for Electrical Inspector approval as per requirement.

A.3.1.21 Bidder shall consider Arc flash protection for the Panels.

A.3.1.22 Bidder can also suggest on new safety features required for safe operation of the switchgear during detailed Engineering.

A.3.1.23 Bidder shall supply mandatory spares for the Project and shall contain following indicated in Table no. 6:

Table - 6: Additional Spares required:

Sr. no.	Spares required in addition to Mandatory Spares	Qty	Remarks
1	GCB	1 no.	
2	Out Going Feeder Breaker	2 no.	
3	Secure Energy Meter	2 no.	

A.3.2 For SAS spares, bidder to refer Section-B.

Automation: (only for BPSU new proposed Standalone protection & control panel):
Newly commissioned Relays of 11kV Switchgear will be integrated with Existing Siemens A8000 Gateway of BPSU on IEC-61850 Standard. Data will be further reported to OSI SCADA on IEC-104 Standard. Siemens Services, if required, will be considered for integration of relays. Required Networking accessories for establishing connectivity with existing Network will be considered. Integrated Testing of all Relay Signals will be carried out as part of SAT.

A.3.3 SPECIAL NOTES TO BIDDERS:

1. The above is only a brief indicative scope of work which helps the bidder to understand the nature of works involved in this project. The bidder is advised to thoroughly refer the above scope of work, detailed technical specifications and tender purpose drawings

before submitting the bid documents to the OWNER. The tender purpose drawings are indicative and may undergo changes during detail engineering phase of the project. In addition to this, BIDDER shall assume whatever is necessary for successful completion and commissioning of the project. Such assumptions must be clearly mentioned in the bid.

2. Bidders are requested to carefully examine and understand the specifications and seek clarifications, if required, to ensure the clear understanding of the specification and requirement. Before submitting the offer, Bidder is required to visit the project site for accessing the feasibility & layout of the system.
3. Project shall be based on a single point responsibility, completely covering the following activities and services in respect of all the equipment specified and covered under the specifications and read in conjunction with Technical Specifications.
4. Bidders are requested to prepare the respective Inter-connecting Schedules (ICS) & estimates for the scope interfacing with each of the other systems at all stations.
5. Compliance with statutory requirement and obtaining clearance from statutory authorities, whenever and wherever required.
6. Packing and transportation from manufacturer's work to the site including customs clearance & port clearance, port charges, if any.
7. Reliability tests, performance and guarantee tests after successful completion of facilities.
8. Insurance and other requirement for the complete transmission Package in accordance with the provisions of general conditions of contract of the bidding document.
9. Bidders to confirm any Technical Deviations in the Technical deviation sheet only. Any deviations mentioned anywhere else in the bid submission will not be considered. Bidder shall also confirm on his letter head if he has not opted for any technical deviation. Bidder to note that after confirmation of no technical deviation, bidder shall meet the requirements as per the bid documents during detailed engineering.

A.3.4 GENERAL REQUIREMENT:

1. The Bidder shall submit the technical requirements, data and information as per the technical data sheets provided in bid documents.
2. The Bidder shall furnish catalogues, engineering data, technical information, design documents, drawings etc., fully in conformity with the technical specification.
3. It is recognized that the Bidder may have standardized on the use of certain components, materials, processes, or procedures different from those specified herein. Alternate proposals offering similar equipment based on the manufacturer’s standard practice will also be considered provided such proposals meet the specified designs, Standard Qualifying performance requirements and are acceptable to the Owner’s. Unless brought out clearly, the Bidder shall be deemed to conform to this specification scrupulously.

4. All deviations from the specification including Quality requirements and Standard Quality Plan shall be clearly brought out in the respective schedule of deviations. Any discrepancy between the specification and the catalogues or the bid, if not clearly brought out in the specific requisite schedule, will not be considered as valid deviation.
5. Equipment furnished shall be complete in every respect with all mountings, fittings, fixtures and standard accessories normally provided with such equipment and/or needed for erection, completion and safe operation of the equipment as required by applicable codes though they may not have been specifically detailed in the Technical Specifications unless included in the list of exclusions. Materials and components not specifically stated in the specification, but which are necessary for commissioning and satisfactory operation of the switchyard/substation unless specifically excluded shall be deemed to be included in the scope of the specification and shall be supplied without any extra cost. All similar standard components/parts of similar standard equipment provided, shall be inter-changeable with one another.

A.3.5 STANDARDS:

1. The works covered by the specification shall be designed, engineered, manufactured, built, tested and commissioned in accordance with the Acts, Rules, Laws and Regulations of India.
2. The equipment to be furnished under this specification shall conform to latest issue with all amendments (as on the date of bid opening) of standard specified in Technical specification, unless specifically mentioned in the specification.
3. The Bidder shall note that standards mentioned in the specification are not mutually exclusive or complete in themselves but intended to complement each other.
4. The Bidder shall also note that list of standards presented in this specification is not complete. Whenever necessary the list of standards shall be considered in conjunction with specific IS, IEC.
5. When the specific requirements stipulated in the specifications exceed or differ than those required by the applicable standards, the stipulation of the specification shall take precedence.
6. Other internationally accepted standards which ensure equivalent or better performance than that specified in the standards specified in individual sections for various equipment's may be accepted, however the salient points of difference shall be clearly brought out in additional information schedule, along with English language version of such standard. The equipment conforming to standards other than specified in the individual sections for various equipment's shall be subject to Owner's approval.
7. The Bidder shall clearly indicate in his bid the specific standards in accordance with which the works will be carried out.

A.3.6 SERVICES TO BE PERFORMED BY THE EQUIPMENT BEING FURNISHED:

1. All equipment's shall also perform satisfactorily under various other electrical, electromechanical, and meteorological conditions of the site of installation.
2. All equipment shall be able to withstand all external and internal mechanical, thermal and electromechanical forces due to various factors like wind load, temperature variation, ice & snow, (wherever applicable) short circuit etc. for the equipment.
3. The Bidder shall design terminal connectors of the equipment considering various forces that are required to withstand.
4. The equipment shall also comply to the following:
   a. To facilitate erection of equipment, all items to be assembled at site shall be "match marked".
   b. All piping, cabling, and wiring, if any between equipment control cabinet / operating mechanism to marshalling box of the equipment, shall bear proper identification to facilitate the connection at site.
   c. Operating times of circuit breakers and protective relays have been specified in respective sections. The Bidder can have minor variations on the individual equipment timings subject to approval of Owner. However, the Owner's decision will be final.

A.3.7 ENGINEERING DATA AND DRAWINGS:

1. The engineering data shall be furnished by the Contractor in accordance with the Schedule for each set of equipment as specified in the Technical Specifications.
2. The Documents shall be submitted through Document management system 'WRENCH'. Necessary training on Wrench Software will be provided to Bidders representative by Consultant. Master Document List (MDL) shall be prepared by contractor and submitted for Owners approval.
3. <u>The drawings will be approved in four categories as follows:</u>
   i. Code I: Approved
   ii. Code II: Approved subject to incorporation of comments as marked. Resubmit for formal approval
   iii. Code III: Not Approved. Incorporate comments as marked. Resubmit for review / approval.
   iv. Code IVa: Retain for Information.
   v. Code IVb: Resubmit after incorporation of comments.

4. It is responsibility of the Bidder to handover all project related drawings in Auto Cad formats only. The pdf version of above drawings / documents shall be routed through Wrench for formal approval process.

5. The Bidder shall submit 6 (six) sets of code I & code IVa approved drawings / design documents / data / test reports to the Owner.

A.3.8 DRAWINGS:

1. All drawings submitted by the Bidder including those submitted at the time of bid shall be with sufficient detail to indicate the type, size, arrangement, material description, Bill of Materials, weight of each component, break-up for packing and shipment, dimensions, internal & the external connections, fixing arrangement required and any other information specifically requested in the specifications.
2. Each drawing submitted by the Bidder shall be clearly marked with the name of the Owner, the unit designation, the specifications title, the specification number and the name of the Project. If standard catalogue pages are submitted, the applicable items shall be indicated therein. All titles, noting, markings and writings on the drawing shall be in English. All the dimensions should be in metric units.
3. Further work by the Bidder shall be in strict accordance with these drawings and no deviation shall be permitted without the written approval of the Owner, if so required.
4. The review of these data by the Owner will cover only general conformance of the data to the specifications and documents interfaces with the equipment provided under the specifications, external connections and of the dimensions which might affect plant layout. This review by the Owner may not indicate a thorough review of all dimensions, quantities and details of the equipment, materials, any devices or items indicated, or the accuracy of the information submitted. This review and/or approval by the Owner shall not be considered by the Contractor, as limiting any of his responsibilities and liabilities for mistakes and deviations from the requirements, specified under these specifications and documents.
5. All manufacturing and fabrication work relating to the equipment prior to the approval of the drawings shall be at the Bidders risk. The Bidder may make any changes in the design, which are necessary to make the equipment conform to the provisions and intent of the Contract and such changes will again be subject to approval by the Owner. Approval of Bidders drawing or work by the Owner shall not relieve the Bidder of any of his responsibilities and liabilities under the Contract.
6. All engineering data submitted by the Bidder after final process including review and approval by the Owner shall form part of the Contract Document and the entire works performed under these specifications shall be performed in strict conformity, unless otherwise expressly requested by the Owner in Writing.
7. The following schedule shall be generally adopted for drawing / document approval and for providing final documentation.

i)	Approval/comments/ by Owner on initial submission	As per agreed schedule
ii)	Resubmission (whenever required)	Within 1 (one) week from date of Comments through Wrench

iii)	Approval or comments	Within 1 (one) week of receipt of resubmission.
iv)	Furnishing of distribution copies in bound volume (3 copies)	2 weeks from the date of final approval for project site
v)	Furnishing of distribution copies of test reports	
	a) Type test reports (3 copies)	2 weeks from the date of final approval
	b) Routine Test Reports (one copy each)	2 weeks from the date of final approval
vi)	Furnishing of instruction/operation manuals (two copies)	As per agreed schedule
vii)	Hard copy of approved RFC drawings (two sets)	As per agreed schedule
viii)	As built drawings (Three sets)	On completion of entire works
ix)	CD / DVD for all as built drawings	On completion of entire works

A.3.9 NOTE:

1. The Bidder may please note that all resubmissions must incorporate all comments given in the earlier submission by the Owner or adequate justification for not incorporating the same must be submitted failing which the submission of documents is likely to be returned.
2. The list of drawings which are required to be referred during execution shall be finalized with the Bidder at the time of Award.
3. All as build drawings should be submitted in the latest Auto CAD Version.
4. The instruction Manuals shall contain full details of drawings of all equipment being supplied under this contract, their exploded diagrams with complete instructions for storage, handling, erection, commissioning, testing, operation, trouble shooting, servicing and overhauling procedures.
5. If after the commissioning of the project, the instruction manuals require any modifications/ additions/changes, the same shall be incorporated and the updated final instruction manuals shall be submitted by the Contractor to the Owner.
6. The Bidder shall furnish to the Owner catalogues of spare parts.

A.3.10 MILESTONE LINKED ENGINEERING APPROVAL PROCEDURE:

1. The Drawing /Document Approval procedure as mentioned in point no.3.1 to 3.3 above is being further linked to specific milestones associated with compliances of Engineering Completion ahead of the project completion schedules and timelines.

2. It is responsibility of Bidder to submit Main Drawings List (MDL) and the Detail Project Execution Schedule of all equipment within 1 (one) month of placement of PO. The Engineering Schedule aligned and ahead of the Project Execution Schedule will determine the timelines for each of the drawing / document submission, approvals, RFC, and final submission of as built drawings for Engineering completion and would be contractually binding. The duration for project completion is generally 12 months from placement of PO. The finalized MDL shall comprise a list of each of the drawings / document along with planned date for submission and code-I approval. The finalized MDL shall be uploaded in Wrench and shall be the basis for determining all milestone related deviations.

3. The finalization of the MDL and Detailed Project Execution Schedule will be taken as a milestone for Detailed Engineering Commencement of the project. This milestone shall be linked to release of payment against Engineering Efforts for an amount of 1 % (One percentage) of the project cost and would be treated as 1% (One) LD in case this milestone is not met.

4. The MDL shall also comprise all those equipments which have significant engineering time and manufacturing time. These are generally the main equipment as tabulated below. Approval of all drawings related to the main equipment for manufacturing clearance / RFC/construction commencement clearance shall be completed within 3 (three) months of Placement of PO.

Sr no.	Main Equipment
1	Civil and Architecture drawings
2	11kV AIS
3	Stand alone Protection, control & Metering Panel.

5. The Code-I approval of all above major equipments will be taken as next milestone for Commencement of the project / Manufacturing clearance. This milestone shall be linked to release of payment against Engineering Efforts for an amount of 2 % (Two percentage) of the project cost and would be treated as 2% (Two) LD in case this milestone is not met.

6. The MDL shall also comprise all those equipments which are generally outsourced by Bidder and takes significant time for bidder's bidding process. These are generally the auxiliary equipment as tabulated below. Approval of all drawings related to the auxiliary equipment for manufacturing clearance / RFC/construction commencement clearance shall be completed within 4 (four) months of Placement of PO.

Sr no.	Auxiliary Equipment
1	BOP Required for Commissioning of 11kV AIS Panels.

7. The Code-I approval of all above auxiliary equipments, as applicable in scope of project, will be taken as next milestone for Commencement of the project / Manufacturing clearance. This milestone shall be linked to release of payment against Engineering Efforts for an amount of 2 % (Two percentage) of the project cost and would be treated as 2% (Two) LD in case this milestone is not met.

8. Further, Bidder to also note that Bidder shall submit “As Built” drawings within 1 (One) Month after successful handover of the commissioned project to the Owner. This would be taken as a milestone of Engineering completion for the project. The final payment of the contract shall be released only after submission of “As built” drawings. In the event of Bidder’s failure to submit the “As built” Drawings in above mentioned timelines retention amount of 2 % (two percentage) of total value of contract shall be withheld.

9. To meet the specified timelines as above, if required, Owner and Bidder shall review, discuss and approve the drawings in the system and across the table. However, in case of Owner representative’s presence at Bidder’s or Bidder’s sub-vendor’s premises/facility the logistical arrangements (to & fro travel and stay etc.) must be done by the Bidder.

A.3.11 MATERIAL / WORKMANSHIP:

1. Where the specification, does not contain references to workmanship, equipment, materials and components of the covered equipment, it is essential that the same must be new, of highest grade of the best quality of their kind, conforming to best engineering practice and suitable for the purpose for which they are intended.
2. In case where the equipment, materials or components are indicated in the specification as “similar” to any special standard, the Owner shall decide upon the question of similarity. When required by the specification or when required by the Owner the Bidder shall submit, for approval, all the information concerning the materials or components to be used in manufacture. Machinery, equipment, materials and components supplied, installed or used without such approval shall run the risk of subsequent rejection, it being understood that the cost as well as the time delay associated with the rejection shall be borne by the Contractor.
3. The design of the Works shall be such that installation, future expansions, replacements and general maintenance may be undertaken with a minimum of time and expenses. Each component shall be designed to be consistent with its duty and suitable factors of safety, subject to mutual agreements. All joints and fastenings shall be devised, constructed and documented so that the component parts shall be accurately positioned

and restrained to fulfil their required function. In general, screw threads shall be standard metric threads. The use of other thread forms will only be permitted when prior approval has been obtained from the Owner.

4. Whenever possible, all similar part of the Works shall be made to gauge and shall also be made interchangeable with similar parts. All spare parts shall also be interchangeable and shall be made of the same materials and workmanship as the corresponding parts of the Equipment supplied under the Specification. Where feasible, common component units shall be employed in different pieces of equipment to minimize spare parts stocking requirements. All equipment of the same type and rating shall be physically and electrically interchangeable.
5. All materials and equipment shall be installed in strict accordance with the manufacturer's recommendation(s). Only first-class work in accordance with the best modern practices will be accepted. Installation shall be considered as being the erection of equipment at its permanent location. This, unless otherwise specified, shall include unpacking, cleaning and lifting into position, grouting, levelling, aligning, coupling of or bolting down to previously installed equipment bases/foundations, performing the alignment check and final adjustment prior to initial operation, testing and commissioning in accordance with the manufacturer's tolerances, instructions and the Specification. All factory assembled rotating machinery shall be checked for alignment and adjustments made as necessary to re- establish the manufacturer's limits suitable guards shall be provided for the protection of personnel on all exposed rotating and / or moving machine parts and shall be designed for easy installation and removal for maintenance purposes. The spare equipment(s) shall be installed at designated locations and tested for healthiness.
6. The Bidder shall supply oil and grease of the proper specification to suit the machinery, as is necessary for the installation of the equipment. Lubricants used for installation purposes shall be drained out and the system flushed through where necessary for applying the lubricant required for operation. The Bidder shall apply all operational lubricants to the equipment installed by him.
7. All oil, grease and other consumables used in the Works/ Equipment shall be purchased in India unless the Bidder has any special requirement for the specific application of a type of oil or grease not available in India. In such is the case he shall declare in the proposal, where such oil or grease is available. He shall help Owner in establishing equivalent Indian make and Indian Contractor. The same shall be applicable to other consumables too.
8. A cast iron or welded steel base plate shall be provided for all rotating equipment which are to be installed on a concrete base unless otherwise agreed to by the Owner. Each base plate shall support the unit and its drive assembly, shall be of design with pads for anchoring the units, shall have a raised up all around and shall have threaded in air connections, if so required.

A.3.12 PROVISIONS TO EXPOSURE FOR HOT & HUMID CLIMATE:

Outdoor equipment supplied under the specification shall be suitable for service and storage under tropical conditions of high temperature, high humidity, heavy rainfall and environment favorable to the growth of fungi and mildew. The indoor equipment's located in non-air-conditioned areas shall also be of same type.

A.3.13 SPACE HEATERS:

1. The heaters shall be suitable for continuous operation at 240 V as supply voltage. On-off switch and fuse shall be provided.
2. One or more adequately rated thermostatically connected heaters shall be supplied to prevent condensation in any compartment. The heaters shall be installed in the compartment and electrical connections shall be made sufficiently away from the heaters to minimize deterioration of supply wire insulation. The heaters shall be suitable to maintain the compartment temperature to prevent condensation.
3. Suitable anti condensation heaters with the provision of thermostat with variable settings shall be provided.

A.3.14 FUNGI STATIC VARNISH:

Besides the space heaters, special moisture and fungus resistant varnish shall be applied on parts, which may be subjected or predisposed to the formation of fungi due to the presence or deposit of nutrient substances. The varnish shall not be applied to any surface of part where the treatment will interfere with the operation or performance of the equipment. Such surfaces or parts shall be protected against the application of the varnish.

A.3.15 VENTILATION OPENING:

Wherever ventilation is provided, the compartments shall have ventilation openings with fine wire mesh of brass to prevent the entry of insects and to reduce to a minimum the entry of dirt and dust. Outdoor compartment openings shall be provided with shutter type blinds and suitable provision shall be made to avoid any communication of air / dust with any part in the enclosures of the Control Cabinets, Junction boxes and Marshalling Boxes, panels etc.

A.3.16 DEGREE OF PROTECTION:

The enclosures of the Control Cabinets, Junction boxes and Marshalling Boxes, panels etc. to be installed shall provide degree of protection as mentioned in the technical specification:
The degree of protection shall be in accordance with IS: 13947 (Part-I) / IEC-947 (Part-I) / IS 12063 / IEC 529. Type test report for degree of protection test, on each type of the box shall be submitted for approval.

A.3.17 RATING PLATE, NAME PLATES & LABELS:

1. Each main and auxiliary item permanently attached to it in a conspicuous position a rating plate of non-corrosive material upon which is to be engraved manufacturer's name, year of manufacture, equipment name, type or serial number together with details of the loading conditions under which the item of substation in question has been designed to operate, and such diagram plates as may be required by the Owner. The rating plate of each equipment shall be according to IEC requirement.
2. All such nameplates, instruction plates, rating plates shall be inscribed in English.
3. The Switchgear Panels shall have name plates such that they are visible distinctly through a camera mounted near the equipment.

A.3.18 DESIGN IMPROVEMENTS / CO-ORDINATION:

1. The Bidder shall note that the equipment offered by him in the bid only shall be accepted for supply. However, the Owner or the Bidder may propose changes in the specification of the equipment or quality thereof and if the Owner & contractor agree upon any such changes, the specification shall be modified accordingly.
2. If any such agreed upon change is such that it affects the price and schedule of completion, the parties shall agree in writing as to the extent of any change in the price and/or schedule of completion before the Bidder proceeds with the change. Following such agreement, the provision thereof shall be deemed to have been amended accordingly.
3. The Bidder shall be responsible for the selection and design of appropriate equipment's to provide the best co-ordinate performance of the entire system. The basic design requirements are detailed out in this Specification. The design of various components, sub-assemblies and assemblies shall be so done that it facilitates easy field assembly and maintenance.
4. The Bidder must coordinate with the agencies (if any) who are Consultants/Contractor for the Owner for all work. The names of agencies shall be intimated to the successful bidders.

5. The contractor should submit monthly progress report to the owner. The format of the report shall be mutually agreed between Owner and Contractor after award of contract.
6. The Bidder will be called upon to attend co-ordination meetings with the Owner, other Bidders and the Consultants of the Owner (if any) during the period of Contract. The Bidder shall attend such meetings at his own cost at mutually agreed venue as and when required and fully cooperate with such persons and agencies involved during those discussions.

A.3.19 QUALITY ASSURANCE REQUIREMENT:

1. To ensure that the equipment and services under the scope of this Contract whether manufactured or performed within the Bidders Works or at his Sub-contractor's premises or at the Owner's site or at any other place of Work are in accordance with the specifications, the Bidder shall adopt suitable quality assurance program to control such activities at all points necessary.
2. Bidder to refer specifications for Quality Assurance requirements.

A.3.20 TYPE AND ACCEPTANCE TESTS:

1. Bidder to refer specifications for Type and Acceptance Requirement.
2. Type Tests shall mean those tests, which are to be carried out to prove the process of manufacture and general conformity of the material to this Specification. These tests shall be carried out on samples prior to commencement of commercial production against the order. The Bidder shall indicate his schedule for carrying out these tests.
3. Acceptance Tests shall mean those tests, which are to be carried out on samples taken from each lot offered for pre-dispatch inspection, for the purposes of acceptance of that lot.
4. Routine Tests shall mean those tests, which are to be carried out on the material to check requirements, which are likely to vary during production.
5. Tests during Manufacture shall mean those tests, which are to be carried out during the process of manufacture and end inspection by the Contractor to ensure the desired quality of the product to be supplied by him.

A.3.21 QUALITY ASSURANCE, INSPECTION, TESTING AND INSPECTION CATEGORIZATION:

1. Bidder shall refer General QAI issued with the bid document.
2. The inspection of the equipment's shall be carried out as per the Quality Plan.

3. Bidder to also refer specific FQP, MQP & guidelines provided in respective specification.

A.3.22 PRE-COMMISSIONING AND COMMISSIONING TESTS:

1. PRE-COMMISSIONING TESTS:

1.1 On completion of erection of the equipment and before charging, each item of the equipment shall be thoroughly cleaned and then inspected jointly by the Owner and the Contractor for correctness and completeness of installation and acceptability for charging, leading to initial pre-commissioning tests at Site. The list of pre- commissioning tests to be performed are given in respective chapters and shall be included in the Contractor's Quality Assurance Program.

1.2 Inspection and testing shall be carried out to ensure that the material and equipment has been installed as required and / or recommended by the equipment manufacturer and as per the latest relevant Indian Standards Specifications, codes, Indian Electricity Rules, requirement of Electrical Inspector and any other authorities having jurisdiction. The installation must pass all inspection and will subject to the approval of the Owner, Electrical Inspector.

1.3 The Owner reserves the right to witness all tests and he shall be notified two weeks before tests are to take place. Owner reserves the right to approve all test results before circuits or equipment is energized for the first time. All results of the tests shall be recorded on test data sheet. Test report shall include for each test, the date of performance and name of the person in charge of the test.

1.4 Before starting the tests, a visual inspection of the material and equipment is to be made to determine that all components are installed as per drawing and in a neat and workman like manner and that in general, the equipment is ready for testing.

A.3.23 COMMISSIONING TESTS:

1. The available instrumentation and control equipment will be used during such tests and the Contractor will ensure valid calibration of all such measuring equipment and devices.
2. Any special equipment, tools and tackles required for the successful completion of the Commissioning Tests shall be provided by the Contractor, free of cost.
3. The specific tests requirements on equipment have been brought out in the Quality Plan.
4. The Contractor shall be responsible for obtaining statutory clearances from all concerned authorities for commissioning the equipment. However necessary fee shall be reimbursed on production of requisite documents.

A.3.24 PACKAGING AND PROTECTION:

1. All the equipment's shall be suitably protected, coated, covered or boxed and crated to prevent damage or deterioration during transit, handling and storage at Site till the time of erection. On request of the Owner, the Contractor shall also submit packing details/associated drawing for any equipment/material under his scope of supply, to facilitate the Owner to repack any equipment/material later, in case the need arises. While packing all the materials, the limitation from the point of view of availability of Railway wagon sizes in India should be considered. The Contractor shall be responsible for any loss or damage during transportation, handling and storage due to improper packing. Any demurrage, wharf age and other such charges claimed by the transporters, railways etc. shall be to the account of the Contractor. Owner takes no responsibility of the availability of the wagons.
2. All coated surfaces shall be protected against abrasion, impact, dis-coloration and any other damages. All exposed threaded portions shall be suitably protected with either a metallic or a non-metallic protecting device. All ends of all valves and piping's and conduit equipment connections shall be properly sealed with suitable devices to protect them from damage.

A.3.25 FINISHING OF METAL SURFACES:

All metal surfaces shall be subjected to treatment for anti-corrosion protection. All ferrous surfaces for external use unless otherwise stated elsewhere in the specification or specifically agreed, shall be hot-dip galvanized after fabrication. High tensile steel nuts & bolts and spring washers shall be electro galvanized to service condition 4. All steel conductors including those used for earthing/grounding (above ground level) shall also be galvanized according to IS: 4826/2629.

A.3.26 HANDLING STORING AND INSTALLATION:

1. In accordance with the specific installation instructions as shown on manufacturer's drawings or as directed by the Owner or his representative, the Contractor shall unload, store, erect, install, wire, test and place into commercial use all the equipment included in the contract. Equipment shall be installed in a neat, workman like manner so that it is level, plumb, square and properly aligned and oriented.
2. Contractor may engage manufacturer's Engineers to supervise the unloading, transportation to site, storing, testing and commissioning of the various equipment being procured by them separately. Contractor shall unload, transport, store, erect, test and

commission the equipment as per instructions of the manufacturer's supervisory Engineer(s) and shall extend full cooperation to them.

3. In case of any doubt/misunderstanding as to the correct interpretation of manufacturer's drawings or instructions, necessary clarifications shall be obtained from the Owner. Contractor shall be held responsible for any damage to the equipment consequent to not following manufacturer's drawings/instructions correctly.
4. Where assemblies are supplied in more than one section, Contractor shall make all necessary mechanical and electrical connections between sections including the connection between buses. Contractor shall also do necessary adjustments/alignments necessary for proper operation of circuit breakers, isolators and their operating mechanisms. All components shall be protected against damage during unloading, transportation, storage, installation, testing and commissioning. Any equipment damaged due to negligence or carelessness or otherwise shall be replaced by the Contractor at his own expense.
5. Bidder shall be responsible for examining all the shipment and notify the Owner immediately of any damage, shortage, discrepancy etc. for Owner's information only. The Bidder shall submit to the Owner every week a report detailing all the receipts during the weeks. However, the Bidder shall be solely responsible for any shortages or damages in transit, handling and/or in storage and erection of the equipment at Site. Any demurrage, wharf age and other such charges claimed by the transporters, railways etc. shall be to the account of the Contractor.
6. The Bidder shall be fully responsible for the equipment/material until the same is handed over to the Owner in an operating condition after commissioning. Contractor shall be responsible for the maintenance of the equipment/material while in storage as well as after erection until taken over by Owner, as well as protection of the same against theft, element of nature, corrosion, damages etc.
7. The Bidder shall be responsible for making suitable indoor storage facilities, to store all equipment which requires indoor storage.
8. The words 'erection' and 'installation' used in the specification are synonymous.
9. Exposed live parts shall be placed high enough above ground to meet the requirements of electrical and other statutory safety codes.
10. The design and workmanship shall be in accordance with the best engineering practices to ensure satisfactory performance throughout the service life. If at any stage during the execution of the Contract, it is observed that the erected equipment(s) do not meet the above minimum clearances as given in clause
11. The Contractor shall immediately proceed to correct the discrepancy at his risks and cost.

A.3.27 EQUIPMENT BASE FRAMES AND FOUNDATION OR BASES:

A cast iron or welded steel base plate shall be provided for all rotating equipment which is to be installed on a concrete base unless otherwise agreed to by the Owner. Each base plate shall support the unit and its drive assembly, shall be of a neat design with pads for anchoring the units, shall have a raised lip all around, and shall have threaded drain connections.

A.3.28 TOOLS AND TACKLES:

1. The Contractor shall supply with the equipment one complete set of all special tools and tackles for the erection, assembly, dis-assembly and maintenance of the equipment. However, these tools and tackles shall be separately, packed and brought on to Site.
2. The work shall be performed using tools designed and approved for the purpose.
3. The contractor shall be responsible for arranging all tools and tackles, instruments, etc. that are required for erection, testing and commissioning of the equipment and materials.
4. A complete set of tools and tackles, which are required for carrying out routine and normal maintenance, shall be furnished along with the Tender in the Bidding Schedules. The price of tools and plants shall not be considered for evaluation.

A.3.29 AUXILIARY SUPPLY:

1. The auxiliary power for station supply, including the equipment drive, for F.H.P. Motors, Space Heaters, cooling system of any equipment, air-conditioning, lighting etc. shall be designed for the specified Parameters as under. The DC supply for the instrumentation shall also conform the parameters as indicated in the following.

Normal Voltage	Variation in	Frequency in HZ	Phase/Wire	Neutral
240V	+/- 10%	50 +/- 5%	1 ph /2 Wire	Solidly Earthed.
415 V	+/- 10%	50 +/- 5%	3 ph/ 4 Wire	Solidly Earthed.
220 V	-	DC	2 wire system	NA
48V		DC	2 wire system	NA

2. Combined variation of voltage and frequency shall be limited to +/- 10%.

A.3.30 SUPPORT STRUCTURE:

The Support structures for all equipment's shall be designed and supplied by the Contractor. All brackets, angles, stool, or other members necessary for attaching the operating mechanism to the supporting structure shall be engineered and supplied by the Contractor as per the specification.

A.3.31 SUBMISSION OF DATA SHEETS:

The Data Sheets for each equipment are attached in the Technical Specification of the bid document for each equipment. The bidder shall submit Data Sheets as advised in the bid document along with the bid for bid evaluation. The Bidder shall confirm submission of all other data sheets during detailed engineering.

A.3.32 COLD EYE REVIEW:

The layout, and scheme proposed by the contractor will be subjected to review from safety, security, constructability, operability and maintainability point of view by Owner, Owner's Engineer or Third party appointed by the Owner. Any comments, requirements, arising out of review, shall be implemented by the contractor without any additional cost implication to the Owner.

A.3.33 PROJECT SCHEDULE:

The complete scope should be completed within 12 months from effective date of contract. Bidder shall submit with the bid, a detailed Project Schedule covering Major milestone and activities.

A4 TERMINAL POINTS:

b. 11kV Switchgear terminations.
c. Remote CRP terminals.

A5 EXCLUSIONS

a) Dismantling of existing switchgear.
b) Civil works.
c) MV cables & Termination.
d) Field Control cables.

A6 CODES AND STANDARDS:

As per section-B.

A7 BIDDERS QUALIFYING REQUIREMENTS:

As per Annexure EPC PQR.

A8 PROJECT SCHEDULE/MILESTONES:

The complete scope should be completed as per project requirement from effective date of contract. Bidder shall submit with the bid, detailed Project Schedule covering Major milestone and activities.

Bidder shall submit with the bid, a detailed Project Schedule covering the following based on the milestones tabulated below:

a. Start of 'Engineering'
b. Completion of 'Engineering'
c. Commencement of 'Manufacturing'/Manufacturing process
d. Commencement of Supply
e. Commencement of Supervision of erection, testing and commissioning

Milestone *	**Target**
Prebid meeting	Within 1 week after issue of bid documents
Bid Submission	Within 2 weeks of tender
Drawing submission	Within 2 week of PO
Inspection of equipment	Within 16 weeks of PO
Delivery of equipment	Within 18 weeks of PO date
Completion of installation	Within 20 weeks of PO date
PG test	NA
Handover to Tata Power after commissioning	As per mutually agreed schedule to meet the project end completion date

A9 SUBMISSION BY BIDDERS:

9.1 Submission along with Tender Document:

Bidder shall submit the following information along with the Technical Bid as per the checklist given at the start.

9.1.1 List of Projects executed with Reference List.
9.1.2 Dully filled in schedules, listed in section ‘C’.
9.1.3 General Arrangement Drawings for equipment offered.
9.1.4 AutoCAD file of AIS layout incorporated in Building Ground Floor layout.

9.1.5 Filled up Data Sheets in enclosed excel format.
9.1.6 Confirmation to adherence to Standard Quality Assurance Plan (SQP), and Standard Field Quality Plan (SFP).
9.1.7 Project Schedule to be prepared and submitted by the bidder along with the bid documents.
9.1.8 Supporting documents for bid qualification criteria and equipment qualification criteria.
9.1.9 Acceptance of Specification by duly signing all the pages and submitting stamped copy of project technical specification.
9.1.10 Duly signed un-priced copy of price schedule along with technical bid.
9.1.11 Bidder to refer Standard Specifications in Section - B for submission of required documents along with Technical Bid and after award of contract.

9.2 After Award of Contract:

9.2.1 Master Document list (MDL) will be finalized along with the bidder to cover the whole project which should cover the following but not limited to.
9.2.2 Technical data sheets and Type tests reports of all equipment's covered under this specification.
9.2.3 GA drawings of all equipment's.
9.2.4 Layout drawings of each system
9.2.5 Detail drawings and design calculation required for civil package.
9.2.6 Hydraulic calculation of system,
9.2.7 Quality Assurance Plan (QAP), Manufacturing Quality Plan (MQP), Field Quality plan (FQP)
9.2.8 Bidder to submit Operation and maintenance manual (5 copies)
9.2.9 Bidder shall submit all the demanded in the individual.
9.2.10 Bidder to refer Standard Specifications in Section - B for submission of required documents along with Technical Bid and after award of contract.

A10 EQUIPMENT & SERVICES - DETAILED TECHNICAL SPECIFICATIONS:

1. For detailed scope of work, bidder to refer Section-B of equipment and system.
2. Any item missing in the Section B but required for successful completion of the project, should be considered in the bidder's scope and Bidder shall submit Data sheet of that equipment's / systems and obtain approval for the same from Owner before proceeding further.

A11 LAYOUT REQUIREMENT:

New 11kV switchgear will be installed at the location of existing switchgear after de-commissioning. Bidder to superimpose offered switchgear in room layout drawings and mandatory to submit along with bids.

It is mandatory for bidder to match all existing Switch board positions to match with Bus-duct position & existing Cable termination along with required arrangement at site. Bider to note that no alteration/adjustment is possible for existing bus-ducts as well as out going cables. Hence center to center alignment of new switchgear shall be matched with existing bus-duct.

A12 QUALITY REQUIREMENTS:

1. Bidder to refer Section-E for General Requirements of Quality Assurance & inspection applicable for the project.
2. Bidder to also refer Section-B and specific FQP & guidelines provided in respective standard specification provided in Section B.

A13 PERFORMANCE REQUIREMENTS

A13.1 TEST PROCEDURE:

Bidder to also refer standard SQP, FSP & guidelines provided in respective standard specification provided in Section B.

A13.2 PERFORMANCE GUARRANTEE PARAMETERS AND LD CLAUSES FOR NON PERFRORMANCE:

13.2.1 Desired Equipment guarantee & its performance guarantee is specified for all the equipment's, under the scope of work, in Volume II, Section B. However, the bidder shall confirm overall Equipment & system Performance Guarantee of 60 months from date of commissioning. This will govern for providing Bank Guarantees against Performance of the equipment's to be supplied for this project.

13.2.2 Bidder shall also refer individual specification of the equipment in Volume II, Section-B

A14 MAINTAINANCE REQUIREMENTS:

As per section-B.

A15 TOOLS AND TACKLES FOR ERECTION AND COMMISSIONING:

Bidder shall arrange for all the tools and tackles required to complete the job.

All safety norms like use of PPE, safe tools and equipment's duly tested and approved by the client will have to be adhered to by the executing agency.

A16 SPARES:

16.1 Bidder needs to include competitive price for Mandatory Spare parts against the below specified list and schedules. For mandatory spares list refer Standard Specifications provided in Section B & Table 6 above.

16.2 The list of Mandatory Spares specified in Standard Specifications of individual equipment shall be supplied by Bidder. The quantification shall be considered as set of Mandatory Spares.

16.3 Bidder shall include list of recommended spares with quantities as recommended by him required for three years trouble free operation of equipment.

Document No. TE00606/SP/0039/FY26 Rev: A Date:10/02/2026	**Specification for Replacement of 11kV AIS at Bhira PH-2, 5 and BPSU Unit.**	

SECTION B

Document No. TE00606/SP/0039/FY26 Rev: A Date:10/02/2026	Specification for Replacement of 11kV AIS at Bhira PH-2, 5 and BPSU Unit.	

B1 – DATA SHEETS

Refer Data Sheet given in Standard Technical specification for equipment
(Bidder to fill Data sheets in Excel format and submit).

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B2 – STANDARD SPECIFICATIONS

(Refer Standard Technical specification for Scope of Work and Equipment).

THE TATA POWER COMPANY LIMITED

STANDARD

TECHNICAL SPECIFICATION

FOR

MEDIUM AIR INSULATED SWITCHGEAR(TRANSMISSION)

(DOCUMENT NO - ENGG/ ELECT/STD-SPEC/2018/48)

Tata Power

Project Engineering

Rev. No	Date	Revision History	Prepared By	Checked By	Approved By
P0	15.01.2018	Preliminary for comments	MRP	DAJ	A Mukherji

Contents

1. INTRODUCTION

This specification covers requirement of 11kV/22kV/33kV Air Insulated Switchgear required for providing 11kV/22kV/33kV feeder supply to distribution system. The design, manufacture, testing at the VENDOR's and/or his SUB-VENDOR's works; supply, transport to site, installation and commissioning of 11kV/22kV/33kV AIR INSULATED SWITCHGEAR (Referred as 11kV/22kV/33kV AIS) including protection relay, multifunction meter, and associated accessories, as specified herein.

2. APPROVED VENDOR LIST & BIDDER'S QUALIFICATION REQUIREMENTS

2.1 APPROVED VENDOR LIST :

Bidder shall adhere to the following make list.

Product / Material description	Manufacturer Name	Factory Location
33kV, 11 kV and 22 kV Switchgear	ABB Limited	Nashik
	Siemens Limited	Kalwa
	Crompton Greaves Ltd. (Only 11 KV)	Nashik
	Schneider Electric India Pvt. Ltd.	Vadodra Kolkata
	L&T Limited	Ahmednagar
	Bharat Heavy Electricals Limited	Bhopal
MV CT/PT (cast resin)	Pragati Electricals	Thane.
	Huphen Electromech	Nashik
	Huphen Fabricator	Nashik
	Schneider	Kolkata
	CGL	Nasik
	Instrans Engg & Mfg. Pvt. Ltd	Bangalore
	Electrical Control & Systems	Vadodara
Indicating Meters (Digital type)	Automatic Electric	Mumbai
	Toshniwal	Mumbai
	Rishab instruments	Mumbai
	Secure Meters	Udaypur
Indicating meter (Analog type)	Automatic electric	Mumbai
	Meco	Mumbai
	Rishab instruments	Nasik
	M.B. Controls	Kolkata
	Motwani	Nashik
	Secure	Jaipur

Power Meters (Assembly of Panel)	Enercon Systems Pvt. Ltd	Banglore
	Alacrity Electronics Limited	Chennai
	Yantra Electronics & Electricals (I) Ltd	Pune
	Central Electricals & Electronics Pvt. Ltd	Mumbai
	Emcon Instruments Pvt. Ltd	Chennai
	M. B. Control & Systems Pvt. Ltd (Dealer of satec, Isael)	New Delhi
Revenue Meters (KWH/TVM)	Elster Meters Ltd	Mumbai
	Secure Meters	Udaypur
	Actaris Metering System Ltd	New Delhi
	Tata Power (TEDS)	Bangalore
	Larsen & Toubro Ltd	Pune
Interposing Relays (For Command Output To MCC)	H&B	Bangalore
	Jyoti	Pune
	National	Ireland
	OEN	Bangalore
MCCB / MPCB	GE Power	Bangalore
	ABB	Nasik
	L&T	Ahemadabad
	Siemens	Goa
	Schneider	Kolkata
LT Fuses (HRC)	L&T	Mumbai
	GE	Pune
	ABB	Banglore
	Schneider	Banglore
1.1kV Power Cables & LT Power Cables	KEC International	Vadodara
	Universal Cables Limited	Satna, MP
	Finolex	Pune
	Nicco Corporation Limited	Kolkata
	Polycab	Silvassa, Vapi
	Ravin Cables	Pune
	Gemscab Industries	Alwar, Rajastan
	CCI	Nashik
Control Cables	KEC International	Vadodara
	Universal Cables Limited	Satna, MP
	Finolex	Pune
	Torrent	Nadiad
	Nicco Corporation Limited	Kolkata
	Ravin Cables	Pune

	Reliance Engineers	Bangalore
	Thermo Cables	Jadcherla, Hyderbad
	Cords Cable Industries Ltd	New Delhi
	Gemscab Industries	Rewadi
Instrumentation Cables	Reliance Engineers	Bangalore
	Associated Cables	Chiplun, MH
	Uday Pyrocables	Pune
	Cosmotec Communication Products Pvt. Ltd. (for Belden make)	Mumbai
	Lapp	Bangalore
	Thermo Cables	Jadcherla, Hyderbad
	Cords Cables Industries Ltd.	Bhiwadi, RJ
Numerical relays/BCPU/IED	GE	Chennai
	ABB	
	Siemens	
Terminal blocks	Connect well	Mumbai
	Elemex	Vadodara

Items supplied of different make other than specified above, is not encouraged however if bidder wishes to offer some other make, shall require prior approval from Owner during bidding stage as per the Bidders Qualifying requirements as given below.

2.2 BIDDER'S QUALIFYING REQUIREMENTS

Bidder must meet all following qualifying criteria:

2.2.1 The Bidder shall be OEM of MV AIS (including Protection and Automation) or must have sourced MV AIS (including Protection and Automation) from a OEM who have supplied and commissioned minimum 300 no. of bays of 11kV/22kV/33kV AIS from Indian factories as on the date of bid opening.

2.2.2 The Bidder shall have carried out design, engineering, supply, erection, testing and commissioning of MV AIS and related automation and communication system for at least 2 projects.

2.2.3 Such systems supplied by the Bidder shall have been in satisfactory commercial operation at least at 2 no. sub-stations for a minimum period of two years as on scheduled date of the bid opening.

2.2.4 All equipment / systems offered shall have been successfully type tested, as per IEC or equivalent relevant standards, at any of the internationally/nationally accredited laboratories. The type test certificate of the equipment shall not be more than 5 years old

as on the scheduled date of bid opening. Time period for type test may be extended by another 5 years as a special case, if there is no change in design / material of construction (MOC).

2.2.5 Bidder shall supply equipment from OEMs having manufacturing facilities in India for major components of package.

2.2.6 Bidder shall provide 5 years warranty for the supplied products/components of package.

2.2.7 Bidder shall adhere to sub-vendor list as mentioned in this specification

2.2.8 General Qualifying Requirements

Acceptance of Owner's preferred list of vendor / sub vendor / OEM, which will be shared as part of Technical Specifications. However, if Bidder introduces additional vendor/sub vendor the same will be evaluated separately. This vendor/sub vendor evaluation / assessment shall inter-alia include (i) document verification; (ii) Bidders work / manufacturing facilities visit (iii) manufacturing capacity, details of works executed, works in hand, anticipated in future and the balance capacity available for present scope of works; (iv) details of plant and machinery, manufacturing and testing facilities, manpower and financial resources; (v) details of quality systems in place; (vi) past experience and performance; (vii) customer feedback; (viii) response to complaint.

2.2.9 Bidder must agree for handing over, to Owner, all project related drawings in AutoCAD format only. The pdf versions of above drawings shall be submitted through Wrench for formal approval process.

2.2.10 Acceptance of minimum quality requirements defined in technical specifications.

2.2.11 Tata Power's preferred list of vendor / sub vendor / OEM, which will be shared as part of Technical Specifications will be accepted by the EPC bidder. However, if bidder introduces additional vendor/sub vendor the same will be evaluated separately as per clauses mentioned below.

a) If bidder introduces additional vendor, bidder must agree to offer and supply the equipment / systems from the new vendor which meets / complies all qualifying requirements mentioned for individual equipment / systems and submit supporting documents to establish the same along with the bid.

b) This vendor/sub vendor evaluation / assessment shall inter-alia include (i) document verification; (ii) bidders work / manufacturing facilities visit (iii) manufacturing capacity, details of works executed, works in hand, anticipated in future and the balance capacity available for present scope of works; (iv) details of plant and machinery, manufacturing and testing facilities, manpower and financial resources; (v) details of quality systems in place; (vi) past experience and performance; (vii) customer feedback; (viii) response to complaint.

c) In the event the bidder proposes to introduce new vendor, bidder will be loaded at the rate of Rs. 2 lakhs per vendor towards resources required to be provided by Tata Power for evaluation of new vendor.

2.2.12 Bidder shall agree to comply with minimum quality requirements and Contractor Safety Code of Conduct, defined in bid documents.

3. SYSTEM DESCRIPTION AND SCOPE

The scope covers design, manufacture, testing at the VENDOR's and/or his SUB-VENDOR's works; supply, transport to site, installation and commissioning of 11kV/22kV/33kV AIR INSULATED SWITCHGEAR (Referred as 11kV/22kV/33kV AIS) including protection relay, multifunction meter, and associated accessories, as specified herein.

Also, the VENDOR shall undertake erection and site testing of 11kV/22kV/33kV Air Insulated metal clad Switchgear and accessories, including the associated main bus bars and cable termination assemblies and associated platforms, supports and internal wiring etc.

The intent of this specification is to provide the work enumerated to be fully complete in every detail for the function designated. It is hereby required that the BIDDER, in accepting the contract, agrees to furnish all apparatus, appliances, material not herein specifically mentioned or included, but which may be found necessary to complete, perfect or test any portion of the apparatus or equipment herein specified in a substantial manner, and in compliance with the requirements implied in this specification and without extra cost to the PURCHASER.

It is not the intent to specify completely herein, all details of design and construction of the equipment. However, the equipment shall conform in all respects to high standards of engineering design and workmanship and can perform in continuous commercial operation up to the VENDOR's guarantees in a manner acceptable to the purchaser, who will interpret the meaning of drawings and specifications and shall be entitled to reject any work / material which in his judgement is not in full accordance therewith.

Whether called for specifically or not, all accessories required for normal operation of equipment are deemed to be a part of VENDOR's scope of supply.

3.1 Design, manufacture, supply of Hardware and Software.

3.2 Installation, testing & commissioning of the RELAY/IED including integration with SCADA System through Gateway on IEC60870-5-104 and performance as specified in the document.

3.3 Integration of the RELAY/IED with Purchaser’s Fault Disturbance Data Collection & Analysis System and Remote Relay Parameterisation System from the Layer 2 switch.

3.4 Supply shall also include Software license, communication protocol licenses and necessary communication cables & interfaces for communication between bidder’s supplied gateway.

3.5 Bidder shall consider and supply the Universal tools (IEC61850) for configuration, parameterization, maintenance and troubleshooting of offered IEDs and System.

3.6 Networking accessories such as Switches, internal Cables, CAT6 UTP cables, Fibre Optic Cables, Fibre Optic Transceivers (FOTEs) if required, LIUs, Patch Cords, Patch panels, RJ45 Connectors, I/O boxes, etc. All switches & FOTEs shall be of industrial grade and of preferred make as mentioned in the Table-1.

3.7 BCPU for each 11kV/22kV/33kV feeder shall be mounted on respective Local Control panel (switchgear panel) along with multifunction meters.

3.8 Cable supply, laying and termination for powering up and networking of the supplied equipment also for MFM and connectivity to the Masters (within the premises).

3.9 Installation and commissioning of Prewired Gateway panel.

3.10 SATEC make PM130 EH+ Multifunction meters shall be mounted on respective switchgear panels for all 11kV/22kV/33kV feeders. Separate MFM shall also be considered for each Bus section voltages (11kV/22kV/33kV). These MFMs shall communicate directly to proposed gateway on MODBUS (RTU) protocol.

3.11 Supply, delivery, installation & integration of Temperature & humidity sensor along with accessories. Cables for integration of the sensors with Gateway shall be on Modbus.

3.12 Integrated Testing of the system at Bidder's works (FAT) before dispatch of the system to the site along with switchgear, protection system and automation system.

3.13 Development of system database, protection schemes, interlock logic and integration with SCADA systems etc. is in the scope of the Bidder.

3.14 Site Acceptance Test to the Purchaser's satisfaction with the completion of the following:

3.14.1 Integration of all the RELAY/IED, MFMs as per the specifications.

3.14.2 Testing of the field equipment through RELAY/IED, MFM from the Purchaser's SCADA Systems.

3.14.3 Demonstration of system response as specified.

3.15 Submission of technical documentation related to design, installation, testing, operation & maintenance of the equipment and submission of Test Reports, job progress reports etc. in hard copies (4 sets) and soft copies (2 sets, preferably in PDF) for Purchaser's approval and record. Final as-built documents shall be submitted in hard copies, PDF as well as in auto CAD format also.

3.16 Maintenance of the system during warranty period as specified. Providing software upgrades and modifications during warranty period.

3.17 Training of Purchaser's personnel.

3.18 Common spares for all supplied power supply modules, power supply distribution modules, Diode-oring-unit, BCPU, I/O modules including interface modules and prefab cables & connectors, spare gateway with OS for 5 years and to ensure MTTR not more than one hour for the failed part restoration.

3.19 Any necessary power conversion shall be Bidder's responsibility for powering up the supplied equipment. So required convertors/inverters shall be supplied, installed & commissioned by the bidder.

3.20 Submission of qualifying documents for product compliance to the IS & IEC standards and the bids in the desired format.

3.21 Bidder shall submit the architecture of the proposed system with BOM mentioning the quantity, make, model and software matrix.

3.22 Bids shall be complete with dimensioned drawings, descriptive literature, all necessary particulars and the required schedules. Incomplete Bids will be rejected.

It is not the intent of this specification to specify completely herein, all details of design & construction of Sub-Station Automation. However, the equipment shall conform in all respects to high standards of engineering, design & workmanship. It is the responsibility of the bidder to provide all necessary hardware, software and necessary resources to commission the system as required by Purchaser and to their satisfaction.

4 CODES AND STANDARDS

The equipment covered by this specification shall unless otherwise stated, be designed, manufactured and tested in accordance with latest editions of the following standards/IEC and shall conform to the regulations of local statutory authorities.

4.1 IS 2705/ IEC 60044-1: Current Transformers

4.2 IS 3156/ IEC 60044-2: Voltage Transformers

4.3 IS 3427/ IEC 62271 -200: HV switchgear and control gear-AC Metal Enclosed switchgear and Control gear for voltages above 1kV and up to and including 52kV.

4.4 IS 694-1990 : PVC insulated cables for working voltage up to and including 1100V

4.5 IS 2629-1985 : Recommended practice for Hot Dip Galvanizing of Iron &Steel

4.6 IS 2633-1986 : Tests for uniformity of zinc coating

4.7 IS 5578-1984 : Guide for marking of insulated conductors

4.8 IS 11353-1985: Guide for uniform system of marking and identification of conductors and apparatus terminals.

4.9 IEC 60060 : Bushings for Alternating Voltage above 1000V

4.10 IEC 60137 : Electrical relays - Single input energizing quantity measuring relays

4.11 IEC 60255 -3: Bushings for Alternating Voltage above 1000V with dependent or independent time.

4.12 IEC 60255-2: Measuring relays and protection equipment-Part-27 Product safety requirement.

4.13 IEC 60265-1: High voltage switches - Part 1: Switches for rated voltages above 1 kV and less than 52 kV

4.14 IEC 60282-1: High voltage fuses

4.15 IEC 60529: Degrees of protection provided by enclosures (IP Code)

4.16 IEC 60694/62271-1: Common specifications for high voltage switchgear and control gear standards

4.17 IEC 60947: Low voltage switchgear and control gear

4.18 IEC 61010-1: Safety requirement for electrical equipment for measurement and

4.19 Laboratory use.
4.20 IEC 61233: High Voltage alternating current Circuit Breaker- Inductive Load
4.21 Switching.
4.22 IEC 62052-11: Electricity metering equipment (a.c.) - General requirements, tests and test Conditions.
4.23 IEC 62053-22: Static meters for active energy (Class 0.2 Sand 0.5 S).
4.24 IEC62271-102: HV switchgear and control gear-Alternating current disconnectors and earthing switches.
4.25 IEC 62271 -100: High voltage alternating current circuit breakers.
4.26 IEC 61634: High Voltage Switchgear and Control gear use and handling of SF6 in High Voltage Switchgear and Control Gear.
4.27 IEC 694: Common clauses for medium voltage switchgear
4.28 IEC 298 / IS 3427: Medium voltage switchgear in metallic enclosure
4.29 IEC 62271 / IS13338: Medium voltage AC circuit breakers
4.30 IEC 265: Medium voltage switches
4.31 IEC 129: AC disconnections & earthing switches
4.32 IEC 801 : Control and monitoring
4.33 IEC 529 / IS 2147: Degree of protection
4.34 IEC 255 : Protection Relays
4.35 IEC 282-1: High voltage fuses

5 DESIGN REQUIREMENTS

Switchgear shall be of metal-clad design and of draw out type and generally in line with the single line diagram enclosed. The bidders shall quote panel/board wise prices for the equipment described in Schedule of quantities.

5.1 DESIGN CRITERIA FOR MV SWITCHGEARS

5.1.1. Sizing Criteria

The Sizing criteria for MV Switchgears shall be the short time fault withstand levels, impulse withstand levels, Continuous Current rating for the MV Switchboards and Modules.

5.1.2. Sizing For fault Conditions

The switchgear shall be supplied as follows:-

(a) Minimum symmetrical short-circuit current breaking capacity as specified in data sheet or as per project requirement for MV switchgear or as per calculations, whichever is higher shall be provided,

(b) Breaker rating shall be selected based on IEC 62271.

(c) Asymmetrical S.C current breaking capacity of the breaker shall consider the higher time constant for decay of current in the vicinity of power generating stations and the breaker offered shall be suitable for the same

(d) Calculations for arriving at the time constant at this plant shall be furnished to justify breaker selection in accordance with IEC-62271.

(e) CT selection for protection:

This shall be based on calculations. It is observed that some bus and CB are short time rated for 3sec /1 sec and such rating is also applicable for CTs and relays associated. All the relays shall be designed with appropriate IP protection class (dust proof) and shall work satisfactory in thermal power plants (with coal dust environment). Most of the relays are short-time rated for 70In or 100In with max secondary amps indicated for 1 sec. The vendor shall select the CT tap, ratio, burden etc based on continuous ratings, short time rating, setting range, sensitivity of protection involved. However, for Outgoing feeders vendor shall decide the time based on calculations to be submitted or as per project requirement.

5.1.3. Sizing For fault Conditions

Fault Level shall be the basic selection Criteria for MV switchgears. Typical Fault ratings are as detailed under Technical parameters (sub-section-II-E1).

5.1.4. Sizing For Load Current Duty

5.1.4.1 The sizing Criteria for a Typical MV Switchboard shall be determined by the size of the transformer feeding the board. As a design Philosophy the Board continuous Current shall be selected as (1.1) * (Full load current at rated voltage on the Transformer's secondary) at 50 deg. C Ambient.

5.1.4.2 11kV/22kV/33kV supply system shall be designed for supplying power to MV drives at 11kV/22kV/33kV level. Each of the switchgear shall have two incomers and bus sections. Each bus section and transformer is rated for 100 % capacity, so that incoming cable fault etc. does not necessitate complete outage of entire switchgear. Interconnection between transformer and 11kV/22kV/33kV Switchgear shall be by bus ducts/cable (project requirement).

5.1.4.3 To have interchange ability of breakers, breaker rating shall be standard and limited to two types / current ratings.

5.1.5. Design of Outgoing feeders:

The various outgoing feeders shall be Feeders for Motors, Auxiliary Transformers, Tie feeders and Supply feeders. While sizing the outgoing feeder the rating is calculated based on the following:

Transformer feeder:	Transformer KVAI primary [Voltage* 1.732] *1.1 (at least)
Tie feeder:	As per system requirement
Incomer feeders:	Generally same as the Board rating
Bus Couplers:	Same as Incomer Feeder rating.

5.1.6. Plant control cable Interconnections

5.1.6.1 Standard control cable sizes shall preferably be 3CX1.5, 5CX1.5, 7CX1.5 & 10CX1.5 mm²

5.1.6.2 Cable size for motor space heater application shall be 2CX2.5 mm²

5.1.6.3 Current Transformer secondary wiring shall with four cores of 4 sq.mm or 6 sq.mm. size

5.1.6.4 Core identification shall be using core color for up to 5-core cable and core number for cable with more cores

5.1.6.5 Separate control cables shall be used for current transformers.

5.1.6.6 Separate control cables shall be laid for EPB (Emergency/Local Push Button) status from EPB to Switchgear for the Switchgear and PLC/DCS.

5.2 GENERAL TECHNICAL REQUIREMENTS :

5.2.1 Switchgear Panel

5.2.1.1 The switchgear boards shall have a single front, single tier, fully compartmentalized, metal enclosed construction complying with IEC 62271-200, comprising of a row of free standing floor mounted panels.

Metal enclosed cubicles shall be divided in the following compartments

a) Bus-bar compartment
b) Circuit breaker compartment
c) Cable compartment
d) LV/Metering compartment
e) Instrument transformer compartment

5.2.1.2 All compartments of the switchgear i.e. bus compartment, breaker compartment, cable compartment and LV compartment shall have isolation. Also, all major and critical components shall be easily accessible for maintenance purposes. Bidder to ensure the availability of compartmentalization between main bus side and feeder side especially for dummy adaptor panels for arresting the fire spread.

5.2.1.3 The adjacent panels shall be completely separated by steel/ aluzinc sheets except in busbar compartments where insulated barriers shall be provided to segregate adjacent panels. The Service Class Continuity of Switchgears shall be LSC 2B-PM (as per IS/IEC 62271-200).However, manufacturer's standard switchgear designs without inter panel barriers in busbar compartment may also be considered with adequate clearances as per applicable standard. Alternate material instead of Polycarbonate material shall be provided as phase barrier in the switchgear.

5.2.1.4 The circuit breakers , contactors and bus VTs shall be mounted on withdrawable trucks which shall roll out horizontally from service position to isolated position. For complete withdrawal from the panel, the truck shall rollout on the floor or shall roll out on telescopic rails. In case the later arrangement is offered, suitable trolley shall be provided by the Contractor for withdrawal and insertion of the truck from and into the panel. The number of trolleys to be provided shall be as specified. Testing of the breaker shall be possible in Isolated position by keeping the control plug connected.

5.2.1.5 The trucks shall have distinct SERVICE and ISOLATED positions. It shall be possible to close the breaker compartment door in isolated position also, so that the switchgear retains its specified degree of protection. Circuit Breaker rack-in and rack-out from Service to Test, Test to Isolated position, or vice-versa shall be possible only in the compartment door closed condition.

5.2.1.6 The switchgear assembly shall be dust, moisture, rodent and vermin proof, with the truck in any position SERVICE, ISOLATED or removed, and all doors and covers closed. All doors, removable covers and glass windows shall have gaskets all round with synthetic rubber or neoprene gaskets.

5.2.1.7 The VT/relay compartments shall have degree of protection not less than IP 5X in accordance with IS/IEC 60947. However, remaining compartments can have a degree of protection of IP 4X. All louvers, if provided, shall have very fine brass or GI mesh screen. Tight fitting gourmet I gaskets are to be provided at all openings in relay compartment. Numerical Relays shall be fully Flush mounted on the switchgear panels at a suitable height.

5.2.1.8 The Switchgear shall have an Internal Arc Classification of IAC FLR as per standard and fault level as per project requirement. The switchgear construction shall be such that the operating personnel are not endangered by breaker operation and internal explosions, and the front of the panels shall be specially designed to withstand these. Pressure relief device shall be provided in each high voltage compartment of a panel, so that in case of a fault in a compartment, the gases produced are safely vented out, thereby minimizing the possibility of its spreading to other compartments and panels. The pressure relief device shall not however reduce the degree of protection of panels under normal working conditions. To demonstrate that the pressure relief device operates satisfactorily the Contractor shall submit the type test report in line with IEC 62271-200 Annex- A. Wherever louvers are provided, the construction of louvers shall be such that the IAC requirements are satisfied. Further, viewing glass windows shall have the same strength as that of enclosure against internal Arc.

5.2.1.9 Explosion vents to be provided over bus bar chamber and other chambers where ever there is possibility of explosions. This shall not cause deterioration to operational easi ness, not at the cost of safety.

5.2.1.10 To demonstrate that the pressure relief device operates satisfactorily the Contractor shall submit the type test report in line with IEC 62271-200 Annex- A. Wherever louvers are provided, the construction of louvers shall be such that the IAC requirements are satisfied. Further, viewing glass windows shall have the same strength as that of enclosure against internal Arc.

5.2.1.11 The manufacturer should provide toughened glass of on inspection window. The toughened glass should either be glued with industrial adhesive or fastened tightly with proper technique. Sliding of glass in a metal bracket shall not be accepted.

5.2.1.12 Enclosure shall be constructed with rolled steel/ aluzinc sections. The doors and covers shall be constructed from cold rolled steel sheets of 2.0 mm or higher thickness. Gland plates shall be 2.5 mm thick made out of hot rolled or cold rolled steel sheets and for non-magnetic material it shall be 3.0 mm.

5.2.1.13 The switchgear shall be cooled by natural air flow.

5.2.1.14 Total height of the switchgear panels shall not exceed 2600 mm. The height of switches, pushbuttons and other hand operated devices shall not exceed 1800 mm and shall not be less than 700 mm.

5.2.1.15 Necessary guide channels shall be provided in the breaker compartments for proper alignment of plug and socket contacts when truck is being moved to SERVICE

position. A crank or lever arrangement shall preferably be provided for smooth and positive movement of truck between Service and Isolated positions.

5.2.1.16 Safety shutters complying with IEC 62271-200 shall be provided to cover up the fixed high voltage contacts on busbar and cable sides when the truck is moved to ISOLATED position. The shutters shall move automatically, through a linkage with the movement of the truck. Preferably it shall however, be possible to open the shutters of busbar side and cable side individually against spring pressure for testing purpose after defeating the interlock with truck movement deliberately. In case, insulating shutters are provided, these shall meet the requirements of IEC 62271-200 and necessary tests as per IEC 62271-200 Clause 5.103.3.3 shall be carried out. A clearly visible warning label "Isolate elsewhere before earthing" shall be provided on the shutters of incoming and tie connections which could be energised from other end.

5.2.1.17 Switchgear construction shall have a bushing or other sealing arrangement between the circuit breaker compartment and the busbar/cable compartments, so that there is no air communication around the isolating contacts in the shutter area with the truck in service position.

5.2.1.18 The breaker and the auxiliary compartments provided on the front side shall have strong hinged doors. Busbar and cabling compartments provided on the rear side shall have separate bolted covers with self-retaining bolts for easy maintenance and safety. Breaker compartment doors shall have locking facility and shall be provided with single shot latch type handle. Suitable interlock shall be provided, which will ensure that breaker is OFF before opening the bolted covers /back doors. For Incomer / Tie panels suitable interlock shall be provided to prevent opening of any compartment doors which has any of the MV (33kV/22kV/11kV) equipment, in case the incoming supply is ON.

5.2.1.19 In the Service position, the truck shall be so secured that it is not displaced by short circuit forces. Busbars, jumpers and other components of the switchgear shall also be properly supported to withstand all possible short circuit forces corresponding to the short circuit rating specified.

5.2.1.20 Suitable base frames made out of steel channels shall be supplied along with necessary anchor bolts and other hardware, for mounting of the switchgear panels. These shall be dispatched in advance so that they may be installed and leveled when the flooring is being done, welding of base frame to the insert plates as per approved installation drawings shall be in Bidders scope.

5.2.1.21 The switchboard shall have the facility of extension on both sides. Adopter panels and dummy panels required to meet the various busbar arrangements, cable/busduct termination and layouts shall be included in Bidders scope of work.

5.2.1.22 All similar component including breaker shall be interchangeable and shall be of same type and rating for easy maintenance and low spare inventory.

5.2.1.23 The 22/33 Kv switchgears where BCPUs are used shall be provide with separate switches for open operations of Breaker manually along with lamp indication (in the vent of

emergency SCADA failure - remote operation not possible) . The switches shall be located on common panel in separate room.

5.2.2 Circuit Breakers

5.2.2.1 The circuit breakers shall be of Vacuum type. They shall comprise of three separate, identical single pole interrupting units, operated through a common shaft by a sturdy operating mechanism.

5.2.2.2 Outgoing breakers shall be suitable for switching transformers and motors at any load. They shall be capable of being used for frequent direct-on-line starting of squirrel cage induction motors. Surge arrestor shall be provided for each motor feeder.

5.2.2.3 Circuit breaker shall be restrike free, stored energy operated and trip free type. Motor wound closing spring charging shall only be acceptable. An anti-pumping relay shall be provided for each breaker, even if it has built-in mechanical anti-pumping features. An arrangement of two breakers in parallel to meet a specified current rating shall not be acceptable.

5.2.2.4 During closing, main poles shall not rebound objectionably and mechanism shall not require adjustments. Necessary dampers shall be provided to withstand the impact at the end of opening stroke. Slow closing facility shall preferably be provided for checking and adjustment of arc chutes, contact wear/tear and poles when the breaker is completely withdrawn and isolated.

5.2.2.5 Plug and socket isolating Contacts for main power circuit shall be silver plated, of self-aligning type, of robust design and capable of withstanding the specified short circuit currents. They shall preferably be shrouded with an insulating material. Plug and socket contacts for auxiliary circuits shall also be silver plated, sturdy and of self-aligning type having a high degree of reliability. Thickness of silver plating shall not be less than 10 microns.

5.2.2.6 All working part of the mechanism shall be of corrosion resisting material. Bearings which require greasing shall be equipped with pressure type grease fittings. Bearing pins, bolts, nuts and other parts shall be adequately secured and locked to prevent loosening or change in adjustment due to repeated operation of the breaker and the mechanism.

5.2.2.7 The operating mechanism shall be such that failure of any auxiliary spring shall not prevent tripping and shall not lead to closing or tripping of circuit breaker. Failure of any auxiliary spring shall also not cause damage to the circuit breaker or endanger the operator.

5.2.2.8 Mechanical indicators shall be provided on the breaker trucks to indicate OPEN I CLOSED conditions of the circuit breaker, and CHARGED/ DISCHARGED conditions of the closing spring. An operation counter shall also be provided. These shall be visible without opening the breaker compartment door.

5.2.2.9 No sliding contact to be used contact to be used in control circuit.

5.2.2.10 The rated control supply voltage shall be as mentioned elsewhere under Technical parameters. The closing coil and spring charging motor shall operate satisfactorily at all

values of control supply voltage between 187V-242V or 93.5V-121 V DC. The shunt trip coil shall operate satisfactorily under all operating conditions of the circuit breaker up to its rated short circuit breaking current at all values of control supply voltage between 154-242V DC 177 V-121 V DC. The trip coil shall be so designed that it does not get energized when its healthiness is monitored by two indicating lamps (Red) and one trip coil supervision relay. Electronic trip coil is not acceptable. Complete trip circuit supervision along with trip coil shall be provided.

5.2.2.11 The time taken for charging of closing spring shall not exceed 30 seconds. The spring charging shall take place automatically preferably after a closing operation. Breaker operation shall be independent of the spring charging motor which shall only charge the closing spring. Opening spring shall get charged automatically during closing operation. As long as power supply is available to the charging motor a continuous sequence of closing and opening operations shall be possible. One open-close- open operation of the circuit breaker shall be possible after failure of power supply to the motor. Spring charging motors shall be capable of starting and charging the closing spring twice in quick succession without exceeding acceptable winding temperature when the control supply voltage is anywhere between 187V-242V9I 3.5V-121 V DC. The initial temperature shall be as prevalent in the switchgear panel during full load operation with 50 deg. C ambient air temperature. The motor shall be provided with short circuit protection.

5.2.2.12 Breaker ON, OFF indications are to be provided both front and back side of the breaker compartment.

5.2.2.13 Motor windings shall be provided with class E insulation or better. The insulation shall be given tropical and fungicidal treatment for successful operation of the motor in a hot, humid and tropical climate.

5.2.2.14 Circuit breaker shall be provided with inter pole barriers of insulating materials. The use of inflammable materials like Hylam shall not be acceptable. Alternate material instead of Polycarbonate material shall be provided as phase barrier in the switchgear.

5.2.2.15 The VCB shall be tested for E2 M2 C2 class of operation

5.2.2.16 Bidder shall ensure that the vacuum breaker switching is suitable for all existing motor feeders, transformer feeders and incomers. Protective gear such as surge protection or surge suppression circuit to be provided by the bidder/manufacturer if required. Bidder to study and consider accordingly.

5.2.2.17 It is preferred that spring charging handle is integral part of the VCB. It should not be a separate entity. If this design is not available, the manufacturer should provide 1 spring charging handle per panel vertical.

5.2.2.18 Capacitor breakers shall be suitable for the following operating conditions

a) Voltage Rating

The breaker shall operate satisfactorily at 33kV continuously for controlling 10/20/30 MVAR capacitor banks.

b) Interrupting Rating

The circuit breaker shall interrupt short circuit currents (not exceeding 40 kA at 33kV) occurring on the capacitor side.

c) Momentary Current Rating
The circuit breaker shall have sufficient momentary current rating to adequately withstand both system short circuit current for faults at its terminals and inrush currents associated with energizing the capacitor bank.

d) Frequency of Operation
The mechanical and electrical design of the breaker shall be such that the breaker will withstand repetitive switching operations.

e) The circuit breaker shall withstand inrush currents due to energizing of a 20 MVAR bank with another 20 MVAR capacitor bank already in service on the associated bus. The breaker shall be capable of making a maximum capacitor inrush current of 8.5 kA at a maximum inrush frequency of 2000 Hz.

f) The capacitor circuit breaker shall be restrike free when switching off a capacitive current of up to 700 Amps. Should there be a reignition under the above condition, it shall not lead to restrike.

5.2.2.19 Circuit breaker performance for switching of inductive load such as shunt reactor, shall be as per requirements of standard IEC 62271-110 – High voltage switchgear and control gear for inductive load switching.

5.2.3 Surge Arrestor:

5.2.3.1 Surge suppressors shall be provided on all motor feeders. Surge Arrestor The surge arrestors shall be provided for all motor feeders and shall be metal oxide, gapless type generally in accordance with IEC 60099-4 and suitable for indoor duty.

5.2.3.2 These shall be mounted within the switchgear cubicle between line and earth, preferably in the cable compartment.

5.2.3.3 Surge arrestor selected shall be suitable for non-effectively earthed system and rating shall be in such a way that the value of steep fronted switching over voltage generated at the switchgear terminals shall be limited to the requirements of switchgear.

5.2.4 Control and Interlocks:

5.2.4.1 The circuit breaker will normally be controlled from remote control panels (PLC/DCS) (via Numerical Relays) through closing and shunt trip coils. The local control console of the relay flush mounted on the switchgear would normally be used only for testing of circuit breaker in isolated position. Provision for closing & tripping of the circuit breaker shall be possible locally from laptop/ relay HMI through serial port shall be possible to facilitate commissioning activities.

5.2.4.2 The basic control scheme shall be developed as per the schematic logics in the relay. The schematics shall be developed in soft inside the relay.

5.2.4.3 Process signal shall be initiated from PLC or DCS, all closing interlock shall be configured in the numerical relays which will give ready status to PLC for closing

5.2.4.4 Facilities shall be provided for mechanical tripping of the breaker/ contactor and for manual charging of the stored energy mechanism for a complete duty cycle, in an emergency in closed door condition.

5.2.4.5 Each panel shall have two separate limit switches, one for the Service position and the other for isolated position. Each of these limit switches shall have at least four (4) contacts which shall close in the respective positions.

5.2.4.6 Auxiliary Contacts of breaker may be mounted in the fixed portion or in the withdrawable truck as per the standard practice of the manufacturer, and shall be directly operated by the breaker operating mechanism. At least 12 NO + 12 NC direct auxiliary contacts shall be provided in breaker. Contact multiplication through auxiliary relays can be provided for additional contacts however such auxiliary relays shall be of latched type. All the incomers & bus couplers (wherever Breaker is available) shall have bi- stable relays for contact multiplication purpose.

5.2.4.7 Auxiliary contacts mounted in the fixed portion shall not be operable by the operating mechanism, once the truck is withdrawn from the service position, but remain in the position corresponding to breaker open position. Auxiliary contacts mounted on the truck portion, and dedicated for PLC/DCS use shall be wired out in series with a contact denoting breaker service position. With truck withdrawn, the auxiliary contacts shall be operable by hand for testing.

5.2.4.8 The contacts of all limit switches and all breaker auxiliary contacts located on truck portion and fixed portion shall be silver plated, rated to make, carry and break 1.0A 240V DC (Inductive)/10A 240V AC. Contacts of control plug and socket shall be capable of carrying the above current continuously.

5.2.4.9 Movement of truck between SERVICE and ISOLATED positions shall be mechanically prevented when the breaker/contactor is closed. An attempt to withdraw a closed breaker shall not trip it.

5.2.4.10 Closing of the breaker shall be possible only when truck is either in ISOLATED or in SERVICE position and shall not be possible when truck is in between. Further, closing shall be possible only when the auxiliary circuits to breaker/contactor truck have been connected up, and closing spring is fully charged.

5.2.4.11 It shall be possible to easily insert breaker of one typical rating into any one of the panels meant for same rating but at the same time shall be prevented from inserting it into panels meant for a different type or rating.

5.2.4.12 Indications shall be provided in the relay console flush mounted on the panel front as brought out in the specification elsewhere. It shall be possible to easily make out whether the truck in SERVICE OR ISOLATED POSITION even when the compartment door is closed.

5.2.4.13 Lock out and tagout(LOTO) arrangement shall be provided for each feeder. LOTO shall prevent mechanical as well electrical operation of disconnectors, earth switch & breaker.

5.2.5 Busbars and Insulators

5.2.5.1 All busbar and jumper connections shall be of high conductivity copper alloy. They shall be adequately supported on insulators to withstand electrical and mechanical stresses due to specified short circuit currents.

5.2.5.2 Busbar cross-section shall be uniform throughout the length of switchgear. Busbars and other high voltage connection shall be sufficiently corona free at maximum working voltage.

5.2.5.3 Contact surfaces at all joints shall be silver plated or properly cleaned and non-oxide grease applied to ensure an efficient and trouble free connection. All bolted joints shall have necessary plain and spring washers. All connection hardware shall have high corrosion resistance. Bimetallic connectors or any other technically proven method shall be used for copper connections.

5.2.5.4 Busbar insulators shall be of arc and track resistant, high strength, non-hygroscopic, non-combustible type and shall be suitable to withstand stresses due to over-voltages, and short circuit current. Busbar shall be supported on the insulators such that the conductor expansion and contraction are allowed without straining the insulators. In case of organic insulator partial discharge shall be limited to 100 pico coulomb at rated voltage x 1.1 /√3. Use of insulators and barriers of in-flammable material such as Hylam shall not be accepted. Alternate material instead of Polycarbonate material shall be provided as phase barrier in the switchgear.

5.2.5.5 The Contractor shall furnish calculation establishing adequacy of busbar sizes for the specified continuous and short time current ratings.

5.2.5.6 All busbars shall be color coded.

5.2.5.7 The temperature of the busbar and all other equipment, when carrying the rated current continuously shall be limited as per the stipulations of relevant Indian Standards, duly considering the specified ambient temperature (50 deg. C). The temperature rise of the horizontal and vertical busbars when carrying the rated current shall in no case exceed 55 deg. C for silver plated joints and 40 deg. C for all other type of joints. The temperature rise at the switchgear terminals intended for external cable termination shall not exceed 40 deg. C. Further the switchgear parts handled by the operator shall not exceed a rise of 5 deg. C .The temperature rise of the accessible parts/external enclosure expected to be touched in normal operation shall not exceed 20 deg. C.

5.2.5.8 Bus bar rating with only natural cooling, without any forced cooling shall be clearly mentioned.

5.2.5.9 Power bus bars shall be insulated and provided with shrouds at all bus bar joints.

5.2.6 Earthing and Earthing Devices

5.2.6.1 A copper earthing bus shall be provided at the bottom and shall extend throughout the length of each switch board. It shall be bolted/ welded to the framework of each panel and each breaker earthing contact bar.

5.2.6.2 The earth bus shall have sufficient cross section to carry the momentary short-circuit and short time fault currents to earth as indicated under switchgear parameters without exceeding the allowable temperature rise.

5.2.6.3 Suitable arrangement shall be provided at each end of the earth bus for bolting to earthing conductors. All joint splices to the earth bus shall be made through at least two bolts and taps by proper lug and bolt connection.

5.2.6.4 All non-current carrying metal work of the switchboard shall be effectively bonded to the earth bus. Electrical continuity of the whole switchgear enclosure frame work and the truck shall be maintained even after painting.

5.2.6.5 The truck and breaker frame shall get earthed while the truck is being inserted in the panel and positive earthing of the truck and breaker frame shall be maintained in all positions i.e. SERVICE and ISOLATED as well as throughout the intermediate travel. The truck shall also get and remain earthed when the control plug is connected irrespective of its position.

5.2.6.6 All metallic cases of relays, instruments and other panel mounted equipment shall be connected to earth by independent stranded copper wires of size not less than 2.5 sq. mm. Insulation colour code of earthing wires shall be green. Earthing wires shall be connected to terminals with suitable clamp connectors and soldering shall not be acceptable. Looping of earth connections which would result in loss of earth connection to other devices, when a device is removed is not acceptable. However, looping of earth connections between equipment to provide alternative paths of earth bus is acceptable.

5.2.6.7 VT and CT secondary neutral point earthing shall be at one place only on the terminal block. Such earthing shall be made through links so that earthing of one secondary circuit may be removed without disturbing the earthing of other circuits.

5.2.6.8 Separate earthing trucks shall be provided by the Contractor for maintenance work. These trucks shall be suitable for earthing the switchgear busbars as well as outgoing/ incoming cables or busducts. The trucks shall have a voltage transformer and an interlock to prevent earthing of any live connection. The earthing trucks shall in addition have a visual and audible annunciation to warn the operator against earthing of live connections.

5.2.6.9 As an alternative to separate earthing trucks the Contractor may also offer built-in earthing facilities for the busbars and outgoing/ incoming connections, in case such facilities are available in their standard proven switchgear design. The inbuilt earthing switches shall have provision for short circuiting and earthing a circuit intended to be earthed. These switches shall be quick make type, independent of the action of the operator and shall be operable from the front of the switchgear panel. These switches shall have facility for padlocking in the earthed condition.

5.2.6.10 Separate earthing connection shall be provided which will directly connect to the earth bus with adequate size of CU or GI strip for following equipment:

a) PTs primary neutral

b) LA's

c) BCPUs

d) Individual compartments LV, CB, BB & CABLE compartments

5.2.6.11 Earthing wires in the LV cubicles shall have exclusive ferrules for identifications.

5.2.6.12 PT Primary neutral grounding shall be firmly grounded and should not be through sliding contact.

5.2.6.13 Location of earth switch shall be after the CT such that shall not create bus fault if the feeder is back-charged.

5.2.7 Interlocks shall be provided to prevent:

5.2.7.1 Closing of the earthing switch if the associated circuit breaker truck is in Service position.

5.2.7.2 Insertion of the breaker truck to Service position if earthing switch is in closed position.

5.2.7.3 Closing of the earth switch on a live connection. Three (3) nos. voltage capacitive dividers shall be provided on each phase of the section intended for earthing and three (3) nos. "RED" neon lamps connected to these on the panel front for visual indication.

5.2.7.4 Energizing an earthed Section.

Complete details of arrangement offered shall be included in the bid, describing the safety features and interlocks.

5.2.7.5 The earthing device (truck/ switch) shall have the short circuit withstand capability equal to that of associated switchgear panel. 4 NO + 4 NC of auxiliary contacts of the earthing device shall be provided for interlocking purpose.

5.2.7.6 All hinged doors shall be earthed through flexible earthing braid.

5.2.7.7 Cable live indicator shall be provided on each feeder. Cable live indicator shall be following features:

a) Voltage present indication shall be self-powered and independent of aux. supply.

b) Suitable for Aux. supply of 0-250V DC system (with center tap grounding)

c) Provision shall be available for measurement of secondary voltages, which shall be used for phasing in measurements.

d) Secondary voltages shall be minimum of 10V wrt to gnd at service voltage of AIS.

e) It shall have 2 relay output contacts for remote indication & interlocking.

f) TEST mode to check the healthiness of indication & contacts.

Indicator shall follow the matrix :

Condition	AUX SUPPLY PRESENT	HT SUPPLY PRESENT	RELAY 1	RELAY 2	FINAL OUTPUT
1	NO	NO	NO	NO	NO
2	YES	NO	NC	NC	NC
3	YES	YES	NC	NO	NO
4	NO	YES	NO	NO	NO

5.2.7.8 Interlocking mechanism shall be provided between cable compartment and breaker to ensure a) back side panel can't be opened unless the breaker is OFF and isolated

condition. B) Breaker shall not go in service unless the back-side cable box cover is closed and locked.

5.2.8 Painting

All sheet steel work shall be pretreated, in tanks, in accordance with IS: 6005. Degreasing shall be done by alkaline cleaning. Rust and scales shall be removed by pickling with acid. After pickling, the parts shall be washed in running water. Then these shall be rinsed in slightly alkaline hot water and dried. The phosphate surfaces shall be rinsed and passivated. After passivation, Electrostatic Powder Coating shall be used. Powder should meet requirements of IS 13871 (Powder costing specification). Finishing paint shade for complete panels excluding end covers shall be RAL7032 . The paint thickness shall not be less than 100 microns. Finished parts shall be suitably packed and wrapped with protective covering to protect the finished surfaces from scratches, grease, dirt and oil spots during testing, transportation, handling and erection.

5.2.9 Instrument Transformers

5.2.9.1 All single-section switchboards shall be provided with two numbers of separate bus VT panels complete with all accessories.

5.2.9.2 Open Delta winding with damping resistor shall be provided in VTs to avoid ferro-resonance to be thought off.

5.2.9.3 All current and voltage transformers shall be completely encapsulated cast resin insulated type, suitable for continuous operation at the ambient temperature prevailing inside the switchgear enclosure, when the switchboard is operating at its rated load and the outside ambient temperature is 50 deg. C. The class of insulation shall be E or better.

5.2.9.4 All instrument transformers shall withstand the power frequency and impulse test voltage specified for the switchgear assembly. The current transformer shall further have the dynamic and short time ratings at least equal to those specified for the associated switchgear and shall safely withstand the thermal and mechanical stress produced by maximum fault currents specified when mounted inside the switchgear for circuit breaker modules. However, current transformer mounted in fuse backed contactor module shall have the dynamic and short time rating compatible with the let through current of the fuses.

5.2.9.5 All instrument transformers shall have clear indelible polarity markings. All secondary terminals shall be wired to separate terminals on an accessible terminal block.

5.2.9.6 Current transformers may be multi or single core and shall be located in the cable termination compartment. All voltage transformers shall be single phase type. The bus VTs shall be housed in a separate panel on a truck so as to be fully withdrawable.

5.2.9.7 Core balance CTs (CBCT) shall be provided on outgoing motor and transformer feeders having CT ratio more than 50/1A. These CBCTs shall be mounted inside the switchgear panel. The window size of CBCTs shall be based on the overall diameter of the cables, to be finalised during detailed engineering. The CBCT shall be of circular window type.

5.2.9.8 All voltage transformers shall have suitable MCB with supervision on secondary sides. PT used for cable back charging indication should not have primary fuse. All voltage transformers shall be designed and manufactured for 0.8 Tesla operating point on 8-H curve. VT shall be fully insulated type (i.e. double pole construction and neutral side fully insulated to rated BIL). VT shall be manufactured without any joint in secondary winding.

5.2.9.9 PT Secondary Protection, MCB with monitoring contact shall be located immediately after secondary terminals.

5.2.9.10 In Bus PT panel Bus charged indications, R, Y, B Lamps shall be provided in prominent locations on the MCC.

5.2.9.11 Bus PT wiring is to be extended to all the panels for integration with relay and EM.

5.2.9.12 CT & PT partial discharge (PD) test to be confirmed by OEM & supporting documents to be made available to Tata Power along with all other documents for FAT . Also the resin composition with details specification shall be provide.

5.2.10 Control Supply and Space Heater Supply

5.2.10.1 Bus PT Panel shall house the control & space heater supply distribution system and other LV equipment common for the board.

5.2.10.2 Each switchboard section shall be provided with two (2) Nos. of 220V DC supply feeders for the control supply with auto changeover scheme located in Bus-coupler LV compartment.

5.2.10.3 Contractor shall provide one 240Vsingle phase to neutral AC supply feeder per switchboard/Switchboard section for space heater supply. Contractor shall provide necessary switch and fuse to receive, isolate and distribute to each panel.

5.2.10.4 Power Supply to Numerical Relay shall be an independent circuit with MCB tapped from the panel DC supply. Exact scheme for segregation of switchgear & numerical relay DC supplies shall be finalized during detailed engineering.

5.2.10.5 Each sub circuit shall have separate MCB. MCB size shall be to achieve selective clearance between main circuit and sub circuit in case of fault. Potential circuits for protection and metering shall also be protected by separate fuse.

5.2.11 Space Heater

5.2.11.1 Each switchgear panel shall be equipped with thermostatically controlled space heater(s), suitably located in breaker and cable compartments to prevent condensation within the enclosure. The space heater shall be connected to 240V single phase AC auxiliary supply available in the switchgear, through switches and fuses provided separately for each panel.

5.2.11.2 For motor space heater supply, one breaker normally closed (NC) auxiliary contact of each motor feeder shall be wired out in series of switch fuse upto terminals block in the respective panels of switch boards. The motor space heater supply shall be taken from

Panel space heater supply given to switch board. For OAF module the space heater circuit & its components shall be rated for min. 16A.

5.2.11.3 A 240V single phase 50Hz AC plug point shall be provided in the interior of each cubicle with ON-OFF switch for connection of hand lamp.

5.2.12 Terminal Blocks

5.2.12.1 Terminal blocks shall be 1100V grade, 10Amps rated, made up of unbreakable polyamide grade of highest system voltage level. The terminals shall be either screw type or screw-less (spring loaded) /cage clamp type with lugs. Marking on terminal strips shall correspond to the terminal numbering in wiring diagrams. All metal parts shall be of non-ferrous material. In case of screw type terminals the screw shall be captive, preferably with screw locking design.

5.2.12.2 Terminal blocks for CT and VT secondary leads shall be of stud type, made up of unbreakable polyamide 6.6 grade. They shall be provided with links to facilitate testing, isolation star/ delta formation and earthing. Terminal blocks for CT secondary shall have the short circuiting facility. The terminals for remote ammeter connection etc. shall also be disconnecting type only. All metal parts shall be of non-ferrous material. Screws shall be captive.

5.2.12.3 At least 10% spare terminals for external connections shall be provided on each panel and these spare terminals shall be uniformly distributed on all terminal blocks. Space for adding another 10% spare terminals shall also be available in each panel.

5.2.12.4 There shall be minimum clearances of 250 mm between the terminal blocks and the cable gland plate and 150 mm between two rows of terminal blocks.

5.2.12.5 All panel wring for external connections shall terminate on separate terminal blocks which shall be suitable for connecting two (2) stranded copper conductors of 2.5 sq. mm on each side, or alternatively, the terminal blocks shall have the possibility of double shorting space to facilitate looping.

5.2.12.6 All the terminal blocks in the LV compartment shall be of disconnecting type links and mounted in such a way that the links drop by gravity. 20% spare terminals to be provided by bidder.

5.2.13 Switchgear Wiring

5.2.13.1 All Switchgear panels shall be supplied completely wired internally upto the terminal block ready to receive external cabling. All inter cubicle wiring and connections between panels of same switchboard including all bus wiring for AC and DC supplies shall be provided / done by the Bidder.

5.2.13.2 All internal wiring shall be carried out with 1100 V grade, single core, 1.5 sq. mm. stranded copper wires having minimum of seven strands per conductor and color coded, PVC insulation. CT circuits shall be wired with 4sq.mm./6 sq.mm. wires which otherwise are similar to the above. Extra flexible wires shall be used for wiring between fixed and moving parts such as hinged doors.

5.2.13.3 All wiring shall be properly supported neatly arranged, readily accessible and securely connected to equipment, terminals and terminal blocks. Wiring troughs or gutters be used for this purpose.

5.2.13.4 Inter-panel wiring for distribution of space heater supply shall be done with copper wires of adequate cross-section to carry the total current of all panel as well as motor space heaters

5.2.13.5 Internal wire terminals shall be made with solderless crimping type tinned copper lugs which shall firmly grip the conductor. Insulation sleeves shall be provided over the exposed parts of lugs.

5.2.13.6 Printed single tube ferrules marked to correspond with panel wiring diagram shall be fitted at both ends of each wire. The wire identification marking shall be in accordance with IS: 375. Red Ferrules shall be provided on trip circuit wiring.

5.2.13.7 Interconnection to adjacent panels shall be brought out to a separate set of terminal blocks located near the slots or holes, meant for the interconnecting wires. Arrangement shall permit neat layout and easy interconnections to adjacent panels at site and wires for this purpose shall be provided by Contractor looped and bunched properly inside the panels.

5.2.13.8 Contractor shall be fully responsible for the completeness and correctness of the internal wiring and for the proper functioning of the connected equipment.

5.2.13.9 Bidder shall submit wiring table along with as-built drawing.

5.2.13.10 The Contractor shall provide the necessary clamps wiring troughs etc. for all wiring inside the switchgear enclosed including the Contractor's power and control cables.

5.2.13.11 In the LV cubicle exclusive inter-panel passage or compartments shall be provided for running the inter-panel wires. The passage shall be divided into two compartments, one for control wiring and the other for SCADA wiring.

5.2.13.12 Shielding shall be provided for AC control cables (CT, PT & AC) to avoid induced voltage in DC circuits.

5.2.14 Power Cable Termination

5.2.14.1 Cable termination compartment shall receive stranded copper conductor, XLPE insulated, shielded, armored/ unarmored, PVC jacketed, single core/ three core, unearthed/earthed grade power cable(s).

5.2.14.2 A minimum clearance of about 600 mm shall be kept between the cable lug bottom ends and gland plates for stress cone formation for XLPE cables. Interphase clearance in the cable termination compartment shall be adequate to meet electrical and mechanical requirement besides facilitating easy connections and disconnection of cables. Dimensional drawing of cable connection compartment showing the location of lug, glands, CTs, gland plates etc. and the electrical clearances available shall be submitted for owner's approval during detail engineering.

5.2.14.3 Cable termination compartment shall have provision for termination of power cables of sizes as indicated during detailed engineering with removable undrilled gland plates. For

all single core cables gland plates shall be of nonmagnetic material. Cable entry shall be from bottom/top. Cable entry will be finalized during detailed engineering.

5.2.15 Name Plates and Labels

5.2.15.1 Each switch board shall have a name plate for its identification. All enclosure mounted equipment hall be provided with individual engraved name plates for clear equipment identification. All panels shall be identified on front as well as backside by large engraved name plates giving the distinct feeder description along with panel numbers. Back side name plates shall be fixed in panel frame and not on the rear removable cover.

5.2.15.2 Name plate shall be of non-rusting metal or 3-ply lamicoid with white engraved letterings, on black background. Letter size shall be of at least 10 mm height.

5.2.15.3 Suitable stenciled paint mark shall be provided for identification of all equipment, located inside the enclosure, as well as for door mounted equipment, from the back side in addition to plastic sticker labels, if provided. These labels shall be located directly by the side of the respective equipment, shall be clearly visible and shall not be hidden by equipment wiring. Labels shall have device number as mentioned in wiring drawings. Type of labels and fixing of labels shall be such that they are not likely to peel off / fall off during prolonged use.

5.2.16 NUMERICAL RELAYS

5.2.16.1 General requirements

a) All Numerical relays shall be of types, proven for the application satisfying requirements specified elsewhere and shall be subject to Employer's approval. Numerical Relays shall have appropriate setting ranges, accuracy, resetting ratio, transient overreach and other characteristics to provide required sensitivity to the satisfaction of the owner.

b) All numerical relays shall be rated for control supply voltage as mentioned elsewhere under system parameters and shall be capable of satisfactory continuous operation between 80-120% of the rated voltage. Making, carrying and breaking current ratings of their contacts shall be adequate for the circuits in which they are used. Contacts for breaker close and trip commands shall be so rated as to be used directly used in the closing and tripping circuits of breaker without the need of any interposing/ master trip relays. Threshold voltage for binary inputs shall be suitably selected to ensure avoidance of mal operation due to stray voltages and typically shall be more than 70% of the rated control supply voltage.

c) One minute power frequency withstand test voltage for all numerical relays shall at least be 2kV (rms).

d) All IEOs shall have freely programmable optically isolated binary inputs (BI) and potential free binary output (BO) contacts, the minimum quantity of which is as follows.

i. Motor feeder- 10 BI + 8 BO
ii. Transformer feeder- 12 BI + 6 BO
iii. Incomer, Bus-coupler, Tie feeder- 14BI + 8 BO

Pick up voltage for BI shall be 50% to 80% of rated voltage.

The above quantities are only indicative and shall be finalized during detailed engineering.

e) Failure of a control supply and de-energization of a relay shall not initiate any circuit breaker operation.

f) Disturbance Record waveforms, event records & alarms shall be stored in Non-volatile memory and failure of control supply shall not result in deletion of any of these data.

g) All the numerical relays shall have communications on two ports, local front port for communication to laptop and one RJ45 port on IEC 61850.

h) All Numerical relays shall have features for electrical measurements including voltage, current, power (active & reactive), frequency, power-factor and energy parameters.

i) Relays shall have event recording feature, recording of abnormalities and operating parameters with time stamping.

j) Master trip (86) and non-86 trips shall be software configurable to output contacts and no separate master trip relay shall be used.

k) All numerical relays shall have provision of both current (CT) and voltage (VT) inputs. Relays shall be suitable for both 5A / 1A CT input.

l) All CT terminals on the relays shall be of fixed type suitable for connection of ring-type lugs to avoid any hazard due to loose connection leading to CT open-circuit. In no circumstances Plug In type connectors shall be used for CT/VT connections.

m) All numerical relays shall have key pad I keys to allow relay setting from relay front. Pre- programmed or programmable key for Master trip (86) reset shall be provided on the relay front. Relay to be self or hand reset shall be software selectable. Manual resetting shall be possible from remote.

n) Relays shall have suitable output contact for circuit breaker failure protection (CBFP).

o) Relays shall have self-diagnostic feature with continuous self-check for power failure, program routines, memory and main CPU failures and a separate output contact for indication of any failure.

p) Relays shall have at least two sets or groups of two different sets of adaptable settings. Relays shall have multiple IEC/ANSII user-programmable characteristics.

q) Design of the relay must be immune to any kind of electromagnetic interference. Vendor to submit all related type test reports for the offered model along with the offer.

r) Relay shall have circuit breaker monitoring features.

All cards/hardware of numerical relays shall be suitable for operation in Harsh Environmental conditions with respect to high temperature, humidity & dust.

5.2.16.2 Protections: Relay Types & Protections

33 kV AIS Panel:

- 33 kV Incomer BCPU: (50/51 + 50/51N + 67/67N + LBB (50Z))
- 33 kV Bus coupler BCPU: (50/51 + 50/51N + 67/67N)
- 33 kV Outgoing BCPU for feeder application: (50/51 + 50/51N)
- 33 kV Outgoing BCPU for Capacitor Bank application: (50/51 + 50/51N + 50 NUB + 49 + 27 + 59 + 59R)
- 33 kV Outgoing BCPU for Reactor Application (two IEDs)

  IED 1: (87L + 24 + 27 + 59)

  IED 2: (50/51 + 50/51N + 49)
- 33 kV Outgoing BCPU for Station Transformer Application: (50/51 + 50/51N)
- 33 kV Bus bar Protection: A high Impedance Differential Protection and Reverse Blocking scheme using IEC 61850 Protocol.

Brief description of the protection functions:

a. 33 kV Incomer will be provided with Directional / Non-directional Protection & LBBU protection.
b. 33 kV Buscoupler will be provided Directional / Non-direction Protection.
c. 33 kV Outgoing feeders / stations transformer will have Non-directional protection.
d. A Composite Numerical relay will be provided for 33 kV Capacitor Bank which includes Overcurrent, NUB, Thermal Overload, Undervoltage & Overvoltage, Residual Overvoltage Protection.
e. 33 kV Reactor will be provided with Differential, over-fluxing, under voltage and Overvoltage Protection.

f. High Impedance Busbar Protection and Reverse Blocking Scheme will be provided as a Busbar Protection.

Numerical Directional Overcurrent & Earth Fault Protection (67 and 67N)

1. Incomer and Buscoupler IED shall have Directional Phase and Earth fault protection.
2. Earth Fault protection shall be based on internal derived open delta voltage.
3 The 67 & 67N protection shall have a setting range of 5 to 200%.
4 The relay shall have all IEC/ANSI Characteristics.
5 The relay shall also include a high set instantaneous over-current unit with a continuously adjustable setting range of 10-2000% of rated current.

LBBU Protection (50Z) on Incomer breaker

1. LBB protection shall be part of main BCPU. The operation of LBB feature shall be based on external initiation only.
2 LBB shall be initiated by Busbar operation, LT O/C operation and Transformer L/O operation and shall give trip signal to Transformer L/O and Busbar L/O.
3 The relay shall be three phase having an operating time less than 20 mS. The setting range shall be 5 to 200% of rated current. A time delay with a continuously adjustable setting of 0.0 to 1 sec shall be provided
4 The relay shall have a continuous thermal withstand capacity to carry four times rated current irrespective of the setting.
5 IN/OUT facility shall be provided for making the LBB operative / in-operative. It should be possible to make the protection IN/OUT through SCADA Command.

Numerical Non-Directional Over-current & Earth Fault Protection (50/51, 50/51N)

1. Three phase Numerical (IDMT) over-current relay and numerical (IDMT) earth fault relays shall be provided for phase over-current and earth fault protection.
2. It shall have a setting range of 5 to 200%.
3. The relay shall have all standard IEC/ANSI characteristics.
4. The relay shall also include a high set instantaneous over-current unit with a continuously adjustable setting range of 10-2000% of rated current.

Numerical Differential Protection for Reactor / Transformer (87)

1. Transformer/Reactor shall be provided differential Protection with facility of 2nd and 5th harmonic restraint, cross-blocking, CT saturation detection, un-restraint hi-set differential protection.
2. The Differential Pick shall be in the range of 1 % to 200 % of the CT rated current

Overfluxing Protection (24)

1. Over fluxing protection shall be provided for Reactor.
2. The Protection shall be provided in two stages -

Thermal Overload Protection (49) **– Only for cap Bank feeder**

1. Thermal Overload protection shall work on the thermal curve
2. The function shall have setting range from 10 % to 200 % of the CT Rated current.
3. The relay shall have all IEC/ANSI Characteristics.

Neutral Unbalance Protection (50NUB) **– Only for cap Bank feeder**

1. The BCPU shall have provision to measure a sensitive current.
2. 50 NUB shall have setting range from 5% to 200 % of the CT Rated current.

Residual Overvoltage Protection (59R) **– Only for cap Bank feeder**

1. The BCPU shall have provision to measure a residual voltage.
2. 59R shall have setting range from 5% to 100 % of the VT Secondary voltage.

Under Voltage and Over voltage (27 & 59) **– Only for cap Bank and Reactor feeder**

1. The BCPU shall have both the functionality – Under voltage and Overvoltage.
2. Both 27 & 59 operation shall be selectable – 1 out of 3 or 3 out 3 etc
3. The setting range shall be from 10% to 200 % of the VT Secondary voltage.
4. Auto cut-in/ cut-out of capacitor bank through relay shall be possible

Numerical Bus Fault Protection – High Impedance busbar protection

High Impedance Busbar Protection:

1. High Impedance bus fault protection shall be implemented by providing exclusive bus fault CT cores.
2. The operating time of the relay at 2 times of the pick-up setting shall not be greater than 15 mS.
3. The relay shall remain stable for external fault conditions and shall not operate on transients.
4. CT saturation due to internal faults and external faults shall not affect the performance of the scheme.
5. Bus Fault CT Secondary Wiring Supervision feature shall be provided in 87B, Min supervision stage pick-up shall be 10 mA:
6. The setting range for Busbar protection shall be in the range of 5 % to 200 %
7. Bus bar protection shall get blocked in case of open / short-ckt on the CT secondary ckt. The alarm for the same shall be provided.
8. CT shorting function shall be available in the relay when bus fault scheme is blocked.
9. Non-linear resistor

Transformer trouble trips for station transformers

Transformer troubles like Buchholz, Winding temperature, Oil temperature & Pressure Relief Device trips shall be wired to separate binary inputs of the relay and shall be configured to issue trip command to the breaker.

Transformer trouble Alarm for station transformers

Alarm contacts of the above transformer troubles shall be wired to separate binary inputs of the relay for communication to HMII DDCMIS.

Supervision of Auxiliary DC Supplies:

Supervision scheme shall be provided to supervise of all auxiliary DC supplies and the Scheme shall initiate annunciation on DC supply failure.

General Relays

Tripping Relays (86)

High speed tripping relays shall be provided for trip functions of various protection schemes. The operating time of the relay shall not be more than 20 mS. The pick-up value of the relay shall be in the range of 50 to 60% of rated voltage. Healthiness of the tripping relays shall be supervised by suitable tripping relay supervision relay. It shall be static type. Wherever reset type relays are prescribed these should be provided with a local and remote reset facility. There should be an illuminated RESET pushbutton for local indication.

Trip Circuit Supervision Relays (95)

Relays for pre-closing and post-closing breaker trip coil supervision shall be provided for all circuit breakers. One (1) relay shall be provided for each trip coil and they shall be connected at the end of tripping loop. Action of the relay shall be annunciated. The relays shall have an inherent limit in time delay of 300 to 400 mS to prevent operation due to transients. The relay shall operate satisfactorily for 80 to 110% of rated supply voltage. It shall be static type.

DC Supply Supervision (80)

DC supply of each protection and alarm scheme shall be monitored by no volt relays. The relay on operation shall give annunciation.

i. Other Protections and Control features

a) Control of breakers shall be carried out from PLC DCS through hardwired control commands in the form of 24V DC signal. Preferably, binary input of all relays shall be configurable to accept 24V DC signals directly from DDCMIS and no separate coupling relays shall be provided.

b) Trip circuit supervision shall be provided for all feeders to monitor the circuit breaker trip circuit both in pre-trip and post-trip conditions.

c) Schematics requiring auxiliary relays/ timers for protection function shall be a part of numerical relay. The number of auxiliary relay and timer functions shall be as required for the application. Timer functions shall be configurable for on & off delays as per requirement.

d) The numerical relay shall be able to provide supervisory functions such as trip circuit monitoring, circuit breaker status monitoring, VT and CT supervision.

e) The numerical processor shall be capable of measuring and storing values of a wide range of quantities, all events, faults and disturbance recordings with a time stamping using the internal real time clock. Battery backup for real time clock in the event of power supply failure shall be provided.

f) At least 200 time tagged events/ records shall be stored with time stamping. Details of at least 5 previous faults including the type of protection operated, operating time, all currents & voltages and time of fault.

g) Diagnostics Automatic testing, power on diagnostics with continuous monitoring to ensure high degree of reliability shall be shall be provided. The results of the self-reset functions shall be stored in battery back memory. Test features such as examination of input quantities, status of digital inputs and relay outputs shall be shall be available on the user interface Sequence of events shall have 1ms resolution at device level. Measurement accuracy shall be 1 % for rated RMS Current and voltage

h) It shall be possible to carryout open/ close operation of breakers from a laptop by interfacing from the relay front port during initial commissioning.

i) 4-20mA analog output (current signal) for use- in PLC DCS shall be provided in all breakers. This may be provided as analog output from the Numerical relay or may be generated using a suitable CT & Current transducer. In case analog output is not available in the relay, the same may be achieved using external 110 device of same make complying with the requirement stated elsewhere in this specification. In addition, any other requirement of digital & analog signals for process controls shall be taken care.

5.2.17 Control and Monitoring:

5.2.17.1 The system shall incorporate the control, monitoring and protection functions specified, self-monitoring, signaling and testing facilities, measuring as well as memory functions, event recording and evaluation of disturbance records.

5.2.17.2 RELAY/IED shall have facility of inclusion of supervision of mA input signals from transducers.

5.2.17.3 The RELAY/IED shall accept direct CT / PT inputs and provide the following minimum analog parameters at 0.2 class accuracy

a. Phase & Neutral Currents
b. Phase Voltages
c. Active & Reactive Power
d. Active & Reactive Energy (Import & Export)
e. Power Factor
f. Frequency
g. Demand

5.2.17.4 Raise and lower operation of OLTC taps of transformer, Control of protection relay systems in or out of service shall be available through Bay controller IED.

5.2.17.5 The operation shall depend on the conditions of other functions, such as interlocking, synchrocheck (if any), etc.

5.2.17.6 Relay Configuration shall be part of Approved drawing. Display Configuration, Control configuration shall be part of approved drawing.

5.2.17.7 The analog values acquired/calculated in bay control/protection/Energy meter unit shall also be displayed locally on the BCPU HMI and in the SCADA Systems. The abnormal values must be discarded if BCPU's are used for analog measurements. The analog values shall be updated every 1 second.

5.2.17.8 Level of Operation with control rights along with sequence of operation to be clearly mentioned (Password Protection).

5.2.17.9 The commands are always to be executed in two stages: selection of the object and command for operation under all mode of operation except emergency operation. Final execution shall take place only when selection and command are actuated.

5.2.17.10 Command execution timer (user configurable) must be available for each digital output. If the control action is not completed within a specified time, the command shall get cancelled.

5.2.17.11 Particulars of Bay Control Protection Units (BCPU) and Numerical O/C & E/F relay (IED)

a) It is proposed to use BCPU and one IED for 33KV AIS to be installed in LCP Panel of AIS. Bay Control Protection Units shall be micro-processor based and have Protection, monitoring, metering and control functions in the same unit.

b) Bay control and protection units are to be considered with 2 no's of fibre optic port at the rear end for SAS networking and RS485 port at rear end for future use. 1 No. Serial USB or 1 No. RJ45 Ethernet port shall be provided for local configuration of the IED.

c) The numerical protection system offered i.e. BCPU & IED shall have at least three years proven field experience. Bidder shall submit the protection schemes implemented by them in other projects (elsewhere) along with the proposal using BCPUs on IEC61850 and GOOSE messaging.

d) Bus fault scheme with dedicated CTs should be provided and shall be mounted on the switchgear itself, which shall have the following

e) High impedance bus fault scheme is in the bidder's scope. Bidder shall consider bus fault scheme for each bus section including CT shorting scheme for each bay bus fault CT core using set reset (Bi-stable RXMB4 type) relay and CT open circuit supervision detection and blocking scheme. The CT supervision relay shall be sensitive enough to detect current of around 5 mA.

f) Bus fault tripping relays 2 nos with sufficient number of contacts shall be provided. Also Bus fault scheme IN/OUT switch suitable for operation from remote shall be provided

g) Bus fault scheme shall be mounted on one of the SWGR panels such as Bus coupler / bus riser/ bus PT panel / dummy panel.

The relay details shall be provided as tabulated below

Numerical High speed high impedance Bus Differential relay:

Following High Impedance bus bar Relay types are acceptable

h) 7SJ80X / 7SJ6X(with sensitive earth fault)- Siemens make

i) DADN- Easun Reyrolle make along with CT open circuit supervision having following characteristics

- Tripping Time (in m Secs) < 80 ms
- Setting Range of Bus Differential Relay
- Voltage operated CT secondary wiring Supervisory feature in main/ discrete Relay
- Setting Range of CT secondary wiring supervisory feature (in main/ discrete relay)
- Adjustable time for CT secondary wiring supervision feature (in main/ discrete relay) (in Secs)
- Max Tripping time (in m Secs) of relay to be mentioned
- Blind zone protection provided for the fault between bus section breaker and CT. Discrete numerical relay for the blind zone protection feature to be provided
- High Speed Tripping Relays to be provided.
- Lockout coil supervision and DC Supply supervision relays for each panel to be provided.
- In case of Distribution Transformer (HV on 33kV) is fed from 33kV AIS, the separate BCPU for Transformer differential protection should be considered with all the flag relays.
- CT shorting scheme for each bay bus fault CT core using set reset (Bi-stable RXMB4 type) relay
- All the above auxiliary relays shall be of ABB make.

j) Design Standards:
The BCPUs shall be multifunctional, designed in accordance with applicable International Electro-technical Commission (IEC), Institute of Electrical and Electronics Engineer (IEEE), American National Standards Institute (ANSI), and National Equipment Manufacturers association (NEMA) standards, unless otherwise specified in this Technical specification. In all cases the provisions of the latest edition or revision of the applicable standards in effect shall apply.

k) BCPU shall offer Binary input processing (Single point, Double points, Multiple points, system input and logic input), all acquired and time stamped at 1 msec accuracy.

l) The auxiliary voltage for the Opto-coupler shall be 220 V/110V DC.

m) The characteristic of the contact outputs per signal / command shall be adjustable via software:

n) Latched/ Non-latched /Time delayed reset
The Digital Output contacts of BCPUs and IEDs shall be rated to drive the Close / Open coils of Circuit Breakers / Isolators / Earth Switches. The contacts shall have the rating 110V/220V DC, 16 A. In addition to the digital output contact, bidder shall provide droppable type of terminal blocks for output contacts.

5.2.17.12 Power Supply:

a) Power supply modules from 48 to 250 V DC +/- 20 % shall be available.

b) A redundant power supply module shall be available for the Gateway unit.

5.2.17.13 Time Synchronization:

a) GPS time synchronization module with GPS receiver used for time synchronization shall be available.

b) Time synchronization interface: The unit shall be capable to synchronize the internal RTC via communication ports on IEEE 1588, SNTP and through direct IRIG-B port through GPS clock.

c) Timing Accuracy: The bay control shall time-tag event reports to an absolute accuracy of 10 IJs or better Bay controls at different system locations shall have the same absolute minimum timing accuracy.

5.2.17.14 Facility for breaker close/open operation:
Facility to operate the breaker using TNC switch on the SWGR when in test/service mode with Local / Remote switch on local shall be provided. Remote control using Local remote switch on Remote through the SCADA system shall be provided. This is a mandatory requirement for the safety of the operating personnel.

5.2.17.15 Emergency Operation:

It shall be possible to open the selected Circuit Breaker with OFF push buttons even during the outage of BCPU (BCPU out of service for maintenance purpose).

5.2.17.16 Reliability & Cooling:

The Unit shall have high reliability in operation and shall not use cooling fans. The unit shall have vermin proof enclosure and shall insulate electronics, internal components and electronics from external environment to avoid failures due to dust, humidity, fungus etc.

5.2.17.17 Expansion in future:

Offered system shall be suitable for extension in future for additional bays. During such requirement, all the drawings and configurations shall be designed in such a manner that its extension shall be easily performed by the Purchaser. During such event, normal operation of the existing substation shall be unaffected and system shall not require a shutdown. The Vendor shall provide all necessary hardware and software tools along with source codes to perform addition of bays in future and complete integration with Purchaser's SCADA System. These hardware and software tools shall be able to configure IED, add additional analogue variable, digital I/Os, modify interlocking logics etc. for additional bays/equipment which shall be added in future.

5.2.17.18 IED parameter setting:

a) It shall be possible to access all protection and control (logic) IEDs for reading the parameters (settings) from the Purchaser's SCADA System or from a Central remote monitoring computer. The setting of parameters or the activation of parameter sets shall only be allowed after entering a password.

b) Level Wise enabling of settings with User Rights shall be incorporated as per the Password protection.

5.2.17.19 Test Function:

a) Vendor to provide the detailed test procedure for testing the BCPU functionalities using IEC61850, GOOSE messaging and protection scheme implemented/proposed. Vendor to ensure availability of the required hardware and software to test the above at the time of FAT and SAT.

b) The protection system shall support a test mode where it shall be possible to set or reset binary input signals, signaling and tripping contacts individually or in groups.

c) All output relay contacts can be blocked via a setting and configuration program. Using the test function, it shall be possible to set or reset signaling and tripping contacts individually.

d) A test sequencer for the local bay protection functions shall be part of the user interface programme. Virtual current, voltage and binary signals shall be

programmable in a minimum of six different sequences to verify the correct operation of the respective functions and settings in the respective bay unit.

e) Vendor shall provide predefined saved cases for test sequence, during commissioning and for routine maintenance.

5.2.17.20 Miscellaneous Accessories:

a) Heater: Each switchgear cubicle shall be equipped with heaters to prevent moisture condensation within the enclosure and shall be complete with switch-fuse unit for power supply. Heaters and switch-fuse units shall be suitable for continuous operation on 240V, 1 phase, 50 Hz. AC supply. Heaters shall be provided with suitable cover to prevent accidental contact during maintenance. Ammeter to be provided on SWGR for indicating locally the current through the space heater and provision to be made to make this current indication available on SCADA.

b) Plug Point: A 240V, 1 phase, 50Hz AC plug point shall be provided in the interior of each cubicle with an on-off switch for connection of hand lamps.

5.2.18 HMI (Front Display):

5.2.18.1 The intuitive user interface and the various communication interfaces allow easy control and monitoring of the switchgear units, simple and comprehensive setting as well as access to readings of extensive recordings.

5.2.18.2 It shall be possible to equip the BCPU with a large HMI for local control, visualization of single line diagrams with analog, alarms and overview of service status (Breakers and Isolators).

5.2.18.3 The graphical display shall be easily configured by means of symbol library.

5.2.18.4 The HMI shall include LEDs for status indication and at least 15 configurable LEDs for alarm indication.

5.2.18.5 The front display shall be able to work in harsh environment, and temperature upto 70℃. Vendor to deliver the HMI display, which shall not blacken out after in use of the BCPU life time.

5.2.19 **Communication Ports:**

5.2.19.1 A galvanic isolated front port shall be available for connection of a personal computer for configuration.

5.2.19.2 2 nos. Electrical RS485 ports for Energy meter and other BCPU (if any).

5.2.19.3 Fiber optic ports of 2 nos for IN and OUT, for fault tolerant fibre-optic ring.

5.2.19.4 2 Nos. IP ports.

5.2.20 Protocols:

5.2.20.1 IEC 61850-8-1, IEC60870-5-104 communication protocol shall be available. The BCPU shall meet the IEC 61850 standard in every respect. Interoperability and interchangeability and with other manufacture's RELAY/IED and tools will be preferred.

5.2.20.2 Data exchange is to be realized using IEC 61850 protocol with a redundant managed switched Ethernet communication infrastructure.

5.2.20.3 All the RELAY/IED must be fully IEC 61850 compliant and must have the following features.

a. Have peer-to-peer communication using GOOSE messages (IEC 61850)
b. For interlocking/ protection schemes.
c. Shall be interoperable with third party IEC 61850 compliant devices
d. Shall generate XML file for integration/engineering with vendor independent SCADA systems.
e. Shall be directly connected to the fibre optic ring and communicating on IEC 61850 without the use of any gateways.

5.2.20.4 IEC61850 GOOSE messaging shall be used to transmit BIs data on the fibre optic LAN to reflex automation/protection schemes.

6 LAYOUT REQUIREMENTS FOR THE EQUIPMENT / SYSTEM

Please ensure the total depth of the panel shall not be more than 2800MM. If required the bus fault CT core to be mounted on floor bushing.
The entire switchgear shall be tropicalised. The sheet steel shall be pre-treated by seven tank process before painting.

6.1 It is expected that Vendor shall visit the respective site where the new 11kV/22kV/33kV switchgear is to be installed and get familiar with the existing arrangement and scope of works. Any alteration/ change in the scope arising out of not visiting the sites will not be accepted while finalizing the contract. Following are the contact details

6.2 Switchgear shall be supplied along with base frame made of 100mm x 50mm channels. The base frame will be fixed on to Purchaser's foundation or flooring and switchgear will be bolted to the base frame by Purchaser.

6.3 Suitable provision for the top and bottom entry for control cables shall be provided.

6.4 Proper inspection window shall be provided on the breaker cubicle to confirm adequate contact penetration of all moving and fixed contacts of breaker i.e. top and bottom moving and fixed contacts of all three phases.

6.5 Dummy Panels shall be provided by the manufacturer between two SWGR panels to match the existing cable openings on the floor so that after alignment, no gaps shall occur

between the panels and it shall be completely vermin proof. Panels shall be aligned in the factory for inspection by customer.

6.6 All the control cables from customer's premises to LV compartment shall be terminated from bottom of the terminal blocks irrespective of the cable entry. Top side of the terminal blocks shall be used for internal wiring.

7 OPERATIONAL AND MAINTENACE REQUIRMENT

7.2 OPERATIONAL REQUIRMENT

The following devices shall be provided:

7.1.1 Spring charging mechanism shall be provided with an adjustable timer with 3 No + 1 NC contacts for alarm and indication for Local/Remote in case of failure of spring not charged in specified time.

7.1.2 It is preferred that an alarm unit is provided to indicate any abnormal condition e.g. spring not fully discharged etc.

Note: In case these devices do not form a standard part of the breaker, they shall be quoted as optional features.

7.1.3 Additional requirements for Vacuum circuit Breakers :

It shall be possible to quickly isolate mechanically the interrupter unit of a vacuum circuit breaker from the breaker operating mechanism for checking loss of vacuum inside the interrupter. Vacuum circuit breaker shall be provided with a suitable metal shield for protecting the testing/maintenance system from X-ray radiation emitted during high voltage testing of interrupter unit.

7.2 MAINTENANCE REQUIRMENT

Requirements for Switchgears

7.2.1 A device to indicate cumulative current interruption carried out by the respective pole and to indicate maintenance/ replacement.

7.2.2 Vendor shall submit delivery schedule for each package. On finalization of contract, vendor shall submit detailed bar chart for retrofitting at each site and each job depending upon which owner will confirm the schedule of outages to the vendor.

7.2.3 Vendor shall submit site specific drawings (in hard as well as in soft format) for the new switchgear panel including site modifications for approval. He will also be responsible for submitting final “As built” drawing in soft and hard form.

7.2.4 In case, installation & commissioning/ retrofitting work will be carried out sub-contractor of the vendor, approval must be obtained from TPC for subcontracting the work and the same shall be indicated in the offer. In the above event, vendor shall depute their full time qualified and skilled engineer to supervise the work at each site from commencement to completion of all work to the entire satisfaction.

7.2.5 The completion period shall be guaranteed. The satisfactory completion of retrofitting work in the agreed time shall be the responsibility of the vendor. In the event of not able to complete the contract or any part thereof for any reason whatsoever, TPC will make alternative arrangements to complete the work at vendor's cost, risk and responsibility.

7.2.6 All tools, tackles, consumables, hardware materials, etc. as required to complete the work shall be in the vendor's scope.

7.2.7 All the handling and transportation of tools, fittings, workmen, etc. shall be in the vendor's scope.

7.2.8 Joint measurements and certification of work: The work done shall be certified by our authorized Engineer with attested joint measurements and completion of the job.

7.2.9 Guarantee of installation, retrofitting and workmanship

Installation and retrofitting shall be guaranteed for a period of 12 months from the date of commissioning. All the work done shall confirm to good quality and good engineering practices. Any subsequent failure attributable to poor designing, workmanship shall be rectified free of charge and promptly by the vendor to the satisfaction of Tata Power.

7.2.10 Record of tests: Wherever necessary, vendor shall maintain and submit the record of all checks/ tests done and the readings obtained as required for the job.

8 TECHNICAL PARAMETERS OF EQUIPMENT (INCL. DATA SHEET)

8.1 Technical Parameters:

8.1.1 33 KV SWITCHGEAR

Sr. No.	Description	Unit	Client specification	Bidders specifications
1.0	Manufacturer's name		*	
2.0	Applicable standard.		IEC60298/IEC62271-100/200	
3.0	Nominal system voltage, phase & frequency	V	33kV,3 phase, 50 Hz	
4.0	System neutral earthing considered		Solidly earth	
5.0	Maximum system voltage	V	36kV	
6.0	1) One minute power frequency withstand voltage 2) 1.2/50 µS impulse withstand voltage	kV rms kV peak	1) 70kV 2) 170kV	
8.0	Short circuit withstand capability a) Short time for 3 sec b) Dynamic rating	kA rms kA peak	As per project requirement	
9.0	Reference ambient temperature	Deg. C	Refer point no. 3 (Particular of the system)	
10.0	Continuous current rating under site reference ambient condition	A	As per project/ source supply rating	
11.0	Maximum temperature of Bus Bars, dropper, connectors & contacts at continuous current rating under site reference ambient temperature	Deg C	90 deg. C for non-silver-plated joints 105 deg. C for silver plated joints	
12.0	Material of bus bars considered		Copper	
13.0	Busbar support insulator	KV	36	
14.0	Busbar joints / connections		Silver faced	
15.0	Busbar rating (with natural cooling only)	A	As per project/ source supply rating	
16.0	Short circuit current rating and duration	RMS	25kA for 3 sec./ 31.5kA for 3 sec/ 40kA for 3 sec./ As per project requirement	
17.0	Cable entry		Bottom/Top	

Sr. No.	Description	Unit	Client specification	Bidders specifications
18.0	Thickness of sheet steel enclosures/ doors.			
	Cold Rolled	mm	2.5	
	Hot rolled	mm	2.5	
19.0	Degree of protection		VT/relay compartment: IP52 Other Compartments: IP42	
20.0	Shade of paints:		RAL 7032	
21.0	Earthing bus bar size & material considered		50 x10 mm (min) copper/As per system requirement	
22.0	Clearance in air of live parts a) phase to phase b) phase to earth		Phase to phase: 351mm Phase to earth : 222 mm	
3.0	Circuit breaker a) Type b) Rated operating duty c) Rated current at site reference ambient temp. d) Rated breaking current e) Rated making current f) Short time current withstand capacity for 3 sec duration g) Asymmetrical breaking current (1) AC component (2) DC component h) operating time (1) Opening time (2) Closing time g) Closing and opening coil particulars. j) Switching over voltage factor	 A KA rms KA peak KA rms KA rms kA Cycles Cycles	 Vacuum O-3min-CO-3min-CO As per project info. 40 Min. 100 Min. 40 Min. 40 Min. as per IEC – 62271 <60 ms <75 ms * 2.2	
24.0	Trip free operating mechanism type		Motor charged spring (manual trip & close facility to be provided)	

Sr. No.	Description	Unit	Client specification	Bidders specifications
25.0	Auxiliary control voltage for trip, close, annunciation and spring charging.		110 V DC (+/- 15 %) or 220V DC (+/- 15%)	
26.0	Auxiliary control voltage for space heater, DC failure annunciation, motor winding / space heaters, lighting etc		230V AC, 1-Ph, 2 wire, 50 Hz	
28.0	Details of CTs 1. Type 2. Ratio 3. Burden 4. Accuracy class 5. Knee point voltage 6. Magnetizing current at Vk/2 7. Secondary resistance 8. Class of insulation 9. Short time & dynamic current rating 10. Applicable standard 11. No. of cores		(CT's shall be cast resin, bar primary, Class E)	
29.0	Details of VTs 1. Type, Ratio, Burden 2. Accuracy class 3. Magnetizing characteristic 4. Method of connection 5. Class of insulation 6. Rated voltage factor (continuous & 8 hours) 7. Applicable standard 8. No. of cores		(Over voltage factor shall be 1.2 continuous, 1.9 for 30 sec.)	
31.0	Particulars of HV current limiting fuses 1. Rated current 2. Voltage class 3. Symmetrical interrupting rating 4. Applicable standard	 A KV KA rms	 By Bidder 33 25kA/31.5kA/40kA/ As per project requirement *	
32.0	Particulars of meters		*	
33.0	Particulars of relays		*	
34.0	Particular of spring charging motors		*	
35.0	Panels construction details		*	
36.0	Type test reports		To be submitted along with BID.	
37.0	Delivery period			

8.1.2 11KV SWITCHGEAR

Sr.No.	Description	Requirement	By Bidder
1	**SWITCHGEAR PANEL**		
1.1	Architecture	Vacuum Insulated Metal Clad	
1.2	No. of Phases	Three	
1.3	Rated Voltage	12 kV	
1.4	Service Voltage	11 kV	
1.5	Rated Frequency	50 Hz	
1.6	Rated Lightning Impulse withstand voltage	75 kVp	
1.7	One Minute Power Frequency Withstand Voltage	28 kV rms	
1.8	Rated short time withstand current	25kA for 3 sec./ 31.5kA for 3 sec/ 40kA for 3 sec./ As per project requirement	
1.9	Peak withstand current rating	62.5 kA peak/ 78.75kA peak/ 100kA peak/	
1.1	Normal service condition	Indoor	
1.11	Internal arc Protection IAC-A FLR as per IEC 62271-200, Shall withstand 25 kA for 1 sec.	IAC-A FLR as per IEC 62271-200, Shall withstand 25 kA/31.5kA/40kA for 1 sec.	
1.12	Degree of Protection	VT/relay compartment: IP52	
		Other Compartments: IP42	
2	**BUS BAR**		
2.1	Type	Extensible on both sides	
2.2	Bus bar continuous rated current	As per project requirement	
2.3	Bus bar material	Copper with Silver Coated contacts	
2.4	Rated short time withstand current	25kA for 3 sec./ 31.5kA for 3 sec./ 40kA for 3 sec./ As per project requirement	
2.5	Max. permissible temperature rated normal current	The maximum permissible current temperature for bus bar shall be as per IEC	

3	**CIRCUIT BREAKER**		
3.1	Application /Class	Indoor	
3.2	Type of circuit	Vacuum (VCB)	
3.3	No. of poles		
3.4	Rated Voltage	12 kV rms	
3.5	Rated Insulation Level	11 KV	
3.6	Lighting impulse	75 kV peak	
3.7	One-minute power frequency withstand	28 kV rms	
3.8	Rated frequency	50 Hz	
3.9	Rated normal current	As per project requirement	
3.1	Rated operating sequence	O-t-CO-T-CO (t=0.3sec, T= 3 min.)	
3.11	Max. Spring Charging Time of Motor	10 sec.	
3.12	Max. Power consumption of Trip & close coils	200 W	
3.13	Rated load breaking current (sym)	25 kA rms/31.5kA for 3 sec./ 40kA for 3 sec./ As per project requirement	
3.14	Rated short circuit withstand current	25 kA rms/31.5kA for 3 sec./ 40kA for 3 sec./ As per project requirement	
3.14	Rated short circuit making current	62.5 kA peak/ 78.75kA peak/ 100kA peak/	
4	**OPERATING AUXILIARY VOLTAGES**		
4.1	For Protection relays	230V DC	
4.2	For Ant condensation Heaters	230V AC	
4.3	Spring Charging Motor (Universal Motor)	230V AC	
4.4	No. of spare auxiliary contacts with wring	8NO + 8 NC	
5	**VOLTAGE TRANSFORMER**		
5.1	Location	Access from Front side of the panel and VT shall be for incomer side	
5.2	Type	Plug In type, Dual ratio	
5.3	Ratio	11kV/√3 / 110/√3 -110/√3	
5.4	Core Details: Accuracy class, Burden	Core-I: 0.2 Class, 30VA	
		Core-II: Class 3P, 30VA	
6	**CURRENT TRANSFORMER**		

6.1	For Metering and Protection		
6.1.1	Ratio	As per SLD	
6.1.2	Core Details: Accuracy class, Burden	Core-I: 0.2 Class, 10VA, Isf <5 Core-II: Class 5P20, 10VA	
6.2	For Differential Protection		
6.2.1	Ratio	As per SLD	
6.2.2	Core Details: Accuracy class, Burden	Core-III: Class 5P20, 10VA	

8.2 PROTECTION AND CONTROL REQUIREMENTS

8.2.1 BCPU:

SN.	Description	Specification
1	Approved vendors	SIEMENS/ ABB/ SCHNEIDER/ ALSTOM
2	System Frequency	50 Hz
3	Rated current	5A
4	Auxiliary Voltage	110V/220V DC (confirm while bidding)
5	Timing Accuracy	10 µs or better
6	Sampling Rate	Disturbance events shall be recorded up to 2 seconds at 8 kHz sampling rate and 5 seconds at 1 kHz sampling rate.
7	Sequential Events &	Latest 1000 entries shall be stored
8	Environment	Shall be suitable for continuous operation over a temperature range of -20℃ to +65℃ in accordance with IEC 60255-6.
9	Ingress Protection	IP 54
10	Protection functions for BCPU	POL & EF with Hiset1,Hiset2, IDMT
		Breaker failure
		Trip Circuit supervision
		Min. two protection Group settings
		Breaker monitoring feature, for monitoring breaker aux contact for timing, trip coil current trace and
		Directional over current feature
		Under voltage & Over voltage
11	Software tools	A user-friendly engineering and disturbance handling tool shall be available.

		Configuration of all input and output logical signals and binary inputs, Analog Inputs and relay outputs for all built-in functions and signals shall be possible both locally and remotely.
		It shall be possible to retrieve/download the disturbance records and parameterization of all RELAY/IED through Gateway/Master.
		It shall be possible to access the RELAY/IED remotely from the Master Station for configuration / maintenance activity. The bay control shall have multilevel passwords to safeguard bay control, logic, and automation settings.
		User friendly on-line monitoring facility of real time data shall be provided to maintenance engineer for monitoring/analyzing the real-time status of the process, program logic from the engineering station (Configuration tool – Laptop).

9 QUALITY REQUIREMENTS, INSPECTION & TESTING (INCL. SQP & SFP)

9.1 To ensure that a well-engineered and contractually compliant system is produced, vendor shall adhere Tata Power's standard quality plan for the preparation of all contract deliverables, which includes hardware, software and documentation. The plan shall provide for early detection of actual or potential deficiencies, timely and effective corrective action, and a method of tracking all such deficiencies.

SQP: TPQAIT-QAXX-00-EX-SQP-072
TPQAIT: TPQAIT-QAXX-00-EX-FQP-121-Rev.0

9.2 Vendor shall submit temperature rise type test reports for breaker carried out along with the breaker panel. In case of retrofitting, Vendor shall extrapolate the temperature rise and submit the temperature rise for the panel in which breaker will be retrofitted. The same shall be submitted for each rating of breaker.

10 PERFORMANCE REQUIREMENTS

10.1 The Vendor shall submit a test specification for factory acceptance test (FAT) and commissioning tests of the system for approval. The purpose is to ensure that the Vendor has interpreted the specified requirements correctly and that the FAT includes checking to the degree required by the user. The general philosophy shall be to deliver a system to site only after it has been thoroughly tested and its specified performance has been verified, as far as site conditions can be simulated in a test lab.

10.2 During FAT the entire System including complete control and protection system to be supplied under present scope shall be tested for complete functionality configuration and performance in factory itself. The extensive testing shall be carried out during FAT. The purpose of Factory Acceptance Testing is to ensure trouble free installation at site. No major configuration setting of system is envisaged at site.

10.3 If the complete system consists of parts from various suppliers or some parts are already installed at site, the FAT shall be limited to sub-system tests. In such a case, the Vendor can use their SCADA System for testing the functionality as per the Purchaser's requirement. Similarly, the complete system test will be performed on site together with the site acceptance test (SAT). Prior to release for shipment of the equipment the Purchaser or his representative will witness Factory Acceptance Test (FAT) in which the system is checked against the specifications.

10.4 The FAT shall include testing of all the hardware and software modules.

10.5 Spare modules and spare channels also will be tested in FAT.

10.6 Bidder shall arrange all the simulation facilities that will be required in FAT & SAT.

10.7 Vendor shall submit FAT procedure 2 weeks before commencement of FAT for purchaser's approval.

10.8 Vendor shall incorporate all FAT comments prior to dispatch. After Vendor confirms that all changes have been incorporated, Purchaser's Office will issue Dispatch Clearance.

10.9 The Test Reports as well as Test Certificates of OEM, third party, Vendor shall be submitted for approval / verification.

10.10 FAT and Dispatch Clearance by the Purchaser shall not relieve the Vendor from complete responsibility for the total system and its performance subsequently.

10.11 Diagnostic tools shall be demonstrated.

10.12 The system shall be kept ON continuously without interruptions for at least 72 hours during the FAT.

10.13 Tests requiring advanced Laboratory facilities that may not be available at site shall be conducted during FAT.

10.14 Training at Vendor's Works shall precede FAT and shall include troubleshooting and advanced testing techniques.

10.15 Local transport for Purchaser's representatives from the place of stay to Vendor's works shall be arranged by the vendor. Vendor shall make available all necessary documentation & office facilities for Purchaser's representatives. Specialists of sub-vendors shall be present for FAT.

10.16 Local transport for Purchaser's representatives from the place of stay to Vendor's works shall be arranged by the vendor. Vendor shall make available all necessary documentation & office facilities for Purchaser's representatives. Specialists of sub-vendors shall be present for FAT. Training at Vendor's Works shall precede FAT and shall include troubleshooting and advanced testing techniques.

10.17 Receipt at site, Handling & Storage and Insurance

The Purchaser shall provide necessary storage space for the system on receipt at site.

All Insurance including but not restricted to transit, storage, and installation and commissioning till the acceptance of the complete system shall be the responsibility of the Vendor.

10.18 Installation

Installation of the complete system is under Bidder's scope. Installation work shall be scheduled and carried out in co-ordination with Purchaser's representatives. All related drawings, installation manuals and recommended practices shall be submitted in advance for Purchaser's approval. Installation shall be certified by the Vendor's representative.

11 SPARES AND SPECIAL TOOLS & TACKLES

11.1 MANDATORY SPARES

Bidder needs to include competitive price for Mandatory Spare parts against the specified list and schedules.

List of Mandatory Spares:

Sr. No.	Description	Quantity
1.	Voltage transformer	3 (1 set) of each type
2.	Current transformers of each type	3 (1 set) of each type
3.	Trip Coil	4 nos.
4.	Closing Coil	4 nos.
5.	CB Spring charging motor	2 nos.
6.	Auxiliary switch (aux. switch assembly, limit position switch, local remote selector switch, breaker control switch, other switches)	1 set
7.	Disconnector motor	1 no. of each type
8.	Bursting disc / pressure relief plate complete as applicable	2 nos. of each type
9.	Capacitive voltage indicator	1 set
10.	Complete breaker set each type for I/C, Tie & O/G feeders	1 set
11.	Vacuum bottles for each type of breaker	1 set
12.	Protection as well as auxiliary relays each type	1 set
13.	Transducer for each type	1 set
14.	Breaker components spare each type	1 set
15.	Panel meter each type	1 set
16.	bus bar support insulators	1 set
17.	push buttons	1 set
18.	indicating lamps	1 set
19.	HV fuse each rating	1 set
20.	MCB's each rating	1 set
21.	power and aux contactors each type and rating	1 set
22.	CT/ VT fuse blocks	1 set
23.	Rack in mechanism	1 set

11.2 SPECIAL TOOLS & TACKLES

BIDDER shall give details of various tools, with price, required for maintenance for trouble free operation thereof.

12 DATA SUBMISSION BY BIDDER

12.1 ALONG WITH BID:

12.1.1 Datasheets

12.1.2 General Arrangement, Plan & Section

12.1.3 Type Test Reports as Per attached SQP

12.2 AFTER AWARD OF CONTRACT

12.2.1 Guaranteed Technical Particulars

12.2.2 General Arrangement, Plan & Section

12.2.3 SLD, Schematics, BOQ

12.2.4 QAP-MQP

12.2.5 Test Plan

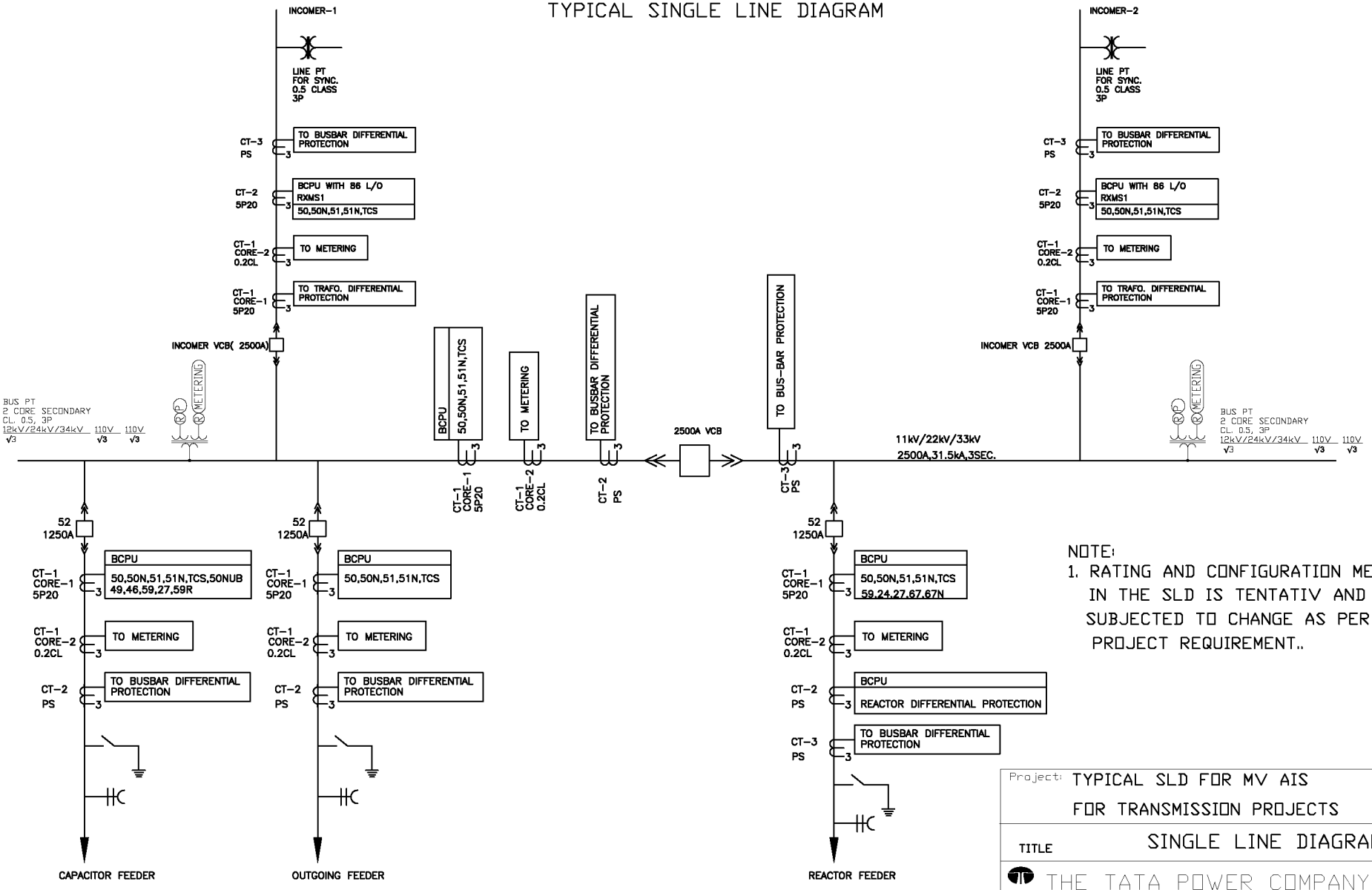
12.2.6 Wiring table along with as-built drawing

13 ANNEXURES

13.1 Annexure-I:- SQP: TPQAIT-QAXX-00-EX-SQP-072-Rev.0

13.2 Annexure-III: -TPQAIT: TPQAIT-QAXX-00-EX-FQP-121-Rev.0

TYPICAL SINGLE LINE DIAGRAM



NOTE:
1. RATING AND CONFIGURATION MENTIONED IN THE SLD IS TENTATIV AND SUBJECTED TO CHANGE AS PER PROJECT REQUIREMENT..

REV	REVISIONS	DRN	CLEARED						APPD	DATE
			CIVIL	ELEC	I & C	MECH	P & L	AUTOM		

Project: TYPICAL SLD FOR MV AIS FOR TRANSMISSION PROJECTS

TITLE: SINGLE LINE DIAGRAM

TATA THE TATA POWER COMPANY LTD.

SCALE : NTS	APPROVED	DATE: (P0 ISSUE) 14-06-2018
DRAWN : MRP		DATE: (CURRENT REV.) 14-06-2018
CHECKED :		
REVIEWED:	DWG. NO.: SH-1	REV.: P0

\\Anant\corporate engineering\01Proj Engg\02Engg ISO\DOCUMENTS\FORMS\Inhouse Dwgs- (A0 to A4)

FORM NO. ENG-FM-39-R0

A3

TATA POWER	The Tata Power Company Limited Corporate Engineering-Quality Assurance Inspection & Testing	TATA
TPQAIT-QAXX-00-EX-FQP-121 REV.0	FIELD QUALITY PLAN FOR LOW & MEDIUM VOLTAGE SWITCHGEAR (from 415 Volt to 33 KV boards)	Date of Issue: March 2016.

Sr. No	COMPONENT / OPERATION	CHARACTERISTICS CHECKED	CLASS OF CHECK	TYPE OF CHECK	EXTENT / FREQUENCY OF CHECK	REFERENCE DOCUMENTS / ACCEPTANCE NORM	FORMAT OF RECORD	REMARKS
1	2	3	4	5	6	7	8	9
1.0	Receipt of Material	Availability of instruction manual/drawing and quality dossier including IRN /DRC	Minor	Physical	100%	IRN/DRC, MDCC, Bill of material, shipping list	Site Inspection register	Any shortfall / damage shall be analyzed and reported through joint protocol with FQC.
		Check shipping details and shortage and damage of material.	Minor	Visual	100%	Dispatch document and packing list		
		Joint inspection of material	Major	Visual	100%			
2.0	Storage & Preservation	Clean & Dry place (Type 2) and ACBs shall be stored inside the store room.	Minor	Visual	100%	Instruction manual	Site Inspection register	For electrical equipments specific arrangement to avoid dust/water/vapor shall be taken care as per manufacturer's practice.
3.0	Transportation from storage yard	Transporting of panels from storage yard to switchgear room using proper loading tools and tackles.	Minor	Physical	100%	Manufacturer's Instruction Manual.	Site Inspection register	
4.0	Unpacking	Joint inspection of material.	Major	Physical	100%	Dispatch document and packing list	Joint inspection record	Any shortfall / damage shall be analyzed and reported through joint protocol with FQC.
		Check and report visual damages and shortages.	Minor	Visual	100%			
5.0	PRE-ERECTION	Check availability of all tools, tackles and ropes etc. required for erection work are available.	Minor	Physical/Visual	100%	Manufacturer's Instruction Manual.	Site Inspection register	
6.0	PANEL ERECTION	Check Switchgear panel location & readiness of foundation.	Minor	Physical	100%	Approved site layout drawing.	Inter departmental handing over protocol	Ensure that, no dust and water / moisture shall enter in the panel during erection.
		Mounting of panel on foundation frame.	Major	Physical	100%	Site layout drawing / Manufacturer's Instruction Manual.	Site Inspection register	
		Check positioning, alignment of panels, tightness of inter panel / intra panel joints.	Major	Physical	100%			
		Check for proper bolting / welding of panels to the base frame (As applicable)	Minor	Physical	100%	Manufacturer's Instruction Manual.		
		Check Tightness of Bus bars joints including Earth bus	Major	Measurement	100%	Manufacturer's Test Certificate.		
		Check for panel / inter panel control wiring, cable termination, ferruling, sleeving, dust and vermin proofing etc.	Critical	Testing	100%	Data sheet / Factory test Report.		
		Ensure Bus duct alignment, verticality and connection, tightness, space heater power on for bus duct. (if applicable)	Critical	Testing	100%	Data Sheet.		
		Check for Bus-bar clearances	Critical	Testing	100%	Data Sheet.		
		Check for Breaker interchangeability						

Sr. No	COMPONENT / OPERATION	CHARACTERISTICS CHECKED	CLASS OF CHECK	TYPE OF CHECK	EXTENT / FREQUENCY OF CHECK	REFERENCE DOCUMENTS / ACCEPTANCE NORM	FORMAT OF RECORD	REMARKS
1	2	3	4	5	6	7	8	9
		Check for phase identification, provision of shrouds, barriers.	Critical	Testing	100%	Data Sheet.		
		Check the complete earthing connection	Major	Physical	100%	Instruction Manual		
7.0	PRE-COMMISSIONING							
7.1	Current Transformer	Insulation resistance measurement between primary & secondary cores.	Critical	Measurement	100%	Testing procedure & standard	Site Inspection report	
		Check for CT Ratio for all cores by primary injection & Polarity tests	Critical	Measurement	100%			
		Winding resistance & Knee point voltage test for protection class CT.	Critical	Measurement	100%			
		Check for connection of equalizing mesh cable	Critical	Measurement	100%			
		Spare CT cores, if any, to be shorted and earthed	Critical	Measurement	100%			
7.2	Voltage Transformer	Insulation resistance test & winding resistance of PT secondary circuit.	Critical	Measurement	100%	Testing procedure & standard	Site Inspection report	
		Ratio test on all cores	Critical	Measurement	100%			
		Polarity test	Critical	Measurement	100%			
		Rack in & rack out (if applicable)	Critical	Measurement	100%			
7.3	Relays	Check operating characteristics by secondary injection and verification of auxiliary contacts.	Critical	Measurement	100%	Testing procedure & standard	Site Inspection report	
		Check minimum pick up voltage of DC coil (if applicable)	Critical	Measurement	100%			
7.4	Breaker	Check for smooth Rack in & rack out operation, correct operation of shutters	Critical	Measurement	100%	Testing procedure & standard	Site inspection report	
		Check control wiring and auxiliary contacts.	Critical	Measurement	100%			
		Check for breaker closing /opening operation & timing test(manually and electrically)	Critical	Measurement	100%			
		Checks for spring charging motor current and timing.	Critical	Measurement	100%			
		Check for correct operation of limit switches	Critical	Measurement	100%			
		Check for MV drop across breaker poles.	Critical	Measurement	100%			
		IR in open and close condition, winding resistance of the breaker coil.	Critical	Measurement	100%			
		High voltage test.	Critical	Measurement	100%			

Sr. No	COMPONENT / OPERATION	CHARACTERISTICS CHECKED	CLASS OF CHECK	TYPE OF CHECK	EXTENT / FREQUENCY OF CHECK	REFERENCE DOCUMENTS / ACCEPTANCE NORM	FORMAT OF RECORD	REMARKS
1	2	3	4	5	6	7	8	9
		Resistance of Closing coil, trip coil & spring charging motor	Critical	Measurement	100%			
		Check for minimum pick up voltage of DC coil (closing & tripping)	Critical	Measurement	100%			
7.5	Indicating Meter	Functional Checks by current injection	Critical	Measurement	100%	Testing procedure & standard	Site inspection report	
7.6	Overall switchgear checks	IR of power and control circuit before & after HV test.	Critical	Measurement	100%	Testing procedure & standard	Site inspection report	
		HV test on bus bar (in all breaker closed condition)	Critical	Measurement	100%			
		Check for Stability thru primary injection	Critical	Measurement	100%			
		MV drop test / contact resistance measurement for bus bar joint.	Critical	Measurement	100%			
		Checking of Test terminal block connection & its shorting arrangement	Critical	Measurement	100%			
		Check for indications, illumination, space heater, thermostat etc.	Critical	Measurement	100%			
		Check for free movement of draw out type feeders and smooth operation of bus bar isolation shutters.	Critical	Measurement	100%			
		Scheme checks for complete switchgear. (Breaker interlocks, auto change over, up stream & down stream isolation & bus coupler operation)	Critical	Measurement	100%			
		Check for adoption of approved Relay settings.	Critical	Measurement	100%			
8.0	COMMISSIONING	Charging clearance of panel	Critical	Measurement	100%	Approved Drg, Data sheet.	Commissioning Report.	
		Check for the voltage, current, frequency	Critical	Measurement	100%			
		Check for the phase sequence & phasing out.	Critical	Measurement	100%			
		Protocol certification & handing over of panel	Critical	Measurement	200%	NA		
9.0	Handing Over							
	Final documentation	Compilation of all stage inspection protocol, test reports including closure of non conformance.	Critical	Visual	100%	NA	*SWCF	Site work completion file

NOTE

A). STATUTORY REQUIREMENTS WILL BE COMPLIED BY THE CONTRACTOR.
B). FOR STAGES WITNESSED / DOCUMENTS REVIEWED BY TATA POWER, COPIES OF RELEVANT DOCUMENTS WILL BE FURNISHED TO TATA POWER.
C). TATA POWER / ITS REP. IDENTIFICATION STAMP ON MATERIALS WILL BE PRESERVED / GOT TRANSFERRED BY TATA POWER / IT'S REP AT APPROPRIATE STAGES. (IF REQUIRED).
D). THE EXTENT INDICATED IN COLUMN 6 IS IN CONTRACTOR'S SCOPE.TATA POWER MAY INSPECT AS PER THIS COLUMN OR RANDOM SAMPLES AT ITS DESCRETION.
E). COLUMN 7 WILL BE AS PER TATA POWER APPROVED DRAWINGS / DATA SHEETS / CONTRACT DOCUMENTS WHEREVER APPLICABLE.
F). INSTRUMENTS FOR LEAK TESTS AND PERFORMANCE TESTS WILL HAVE VALID CALIBRATION CERTIFICATE WITH TRACEABILITY TO NATIONAL LEVEL.

TATA POWER	The Tata Power Company Limited Corporate Engineering-Quality Assurance Inspection & Testing	TATA
TPQAIT-QAXX-00-EX-FQP-121 REV.0	FIELD QUALITY PLAN FOR LOW & MEDIUM VOLTAGE SWITCHGEAR (from 415 Volt to 33 KV boards)	Date of Issue: March 2016.

Sr. No	COMPONENT / OPERATION	CHARACTERISTICS CHECKED	CLASS OF CHECK	TYPE OF CHECK	EXTENT / FREQUENCY OF CHECK	REFERENCE DOCUMENTS / ACCEPTANCE NORM	FORMAT OF RECORD	REMARKS
1	2	3	4	5	6	7	8	9
Critical Category is HOLD point.		This activity required inspection / Verification & acceptance by inspection authority responsible for this stage before further processing is permitted., 24 Hrs advance notice to be given to FQC. Contractor /sub contractor shall not process activity beyond this point without written permission by TATA POWER FQC. This activity shall be formed by TATA POWER (Execution + FQC), Main & Sub- Contractor (Execution + FQC) . (Also Surveillance by Head FQC / Project Head)						
Major Category is Witness point.		This activity required inspection / Verification & acceptance by inspection authority responsible for this stage before further processing. 24 Hrs advance notice to be given to TATA POWER (Execution) . Contractor /sub contractor shall not process activity beyond Witness point without written permission by TATA POWER (Execution). This activity shall be performed by TATA POWER (Execution), Main and Sub- Contractor (Execution + FQC) . (Surveillance by FQC)						
Minor Category is Review point.		This activity required review of documents by TATA POWER for the compliance & acceptance, However 24 Hrs advance notice to be given to TATA power (Execution). This activity shall be formed by Main and Sub- Contractor (Execution + FQC) . (Surveillance by Execution / Project Head).						
		TATA POWER FQC is also authorized to carryout surveillance in any major & minor class of check at their discretion.						

STORAGE TYPE:

TYPE-1: OPEN & ABOVE GROUND ON WOODEN PLANK WITH SLOPE FOR WATER DISPOSITION.
TYPE-2: OPEN AREA AND ABOVE GROUND ON WOODEN PLANK (WITH SLOPE FOR WATER DISPOSITION) AND COVERED WITH TARPAULIN.
TYPE-3: OPEN SHED WITH FULLY FORMED FLOORING / CEMENT FLOORING.
TYPE-4: COVERED SHED / STORE ROOM ON RACKS AND IDENTIFIED LOCATION.
TYPE-4A: CLOSED CHAMBER WITH TEMPERATURE & HUMIDITY CONTROL.

		RRP 21/03/16.	CRB 21/3/16	21/3/16
Rev. No	Reason for Revision	Prepared By & Date	Checked By & Date	Approved By & Date
R0	ISSUE FOR USE	RRP / 12.03.2016	CRB/ 12.03.2016	SS/

Meant for (Internal Circulation / External – Stakeholders Circulation)

TATA POWER	The Tata Power Company Limited **Corporate Engineering-Quality Assurance** **Inspection & Testing**	TATA
TPQAIT-QAXX-00-EX-SQP-072 **REV.0**	**STANDARD QUALITY PLAN FOR INDOOR MEDIUM VOLTAGE SWITCHGEAR (3.3KV TO 33KV)**	**Date of Issue:**

Document Title
STANDARD QUALITY PLAN FOR INDOOR MEDIUM VOLTAGE SWITCHGEAR (3.3KV TO 33KV)

		30/03/2015	30/3/2015	30/3/15	
0	Initial Submission.	RP	CRB (Head QAI- E)	SGP Chief (QAIT)	
Revision No.	Reason for revision	Prepared By & Date	Checked By & Date	Approved By & Date	Issued by & Date

TATA POWER	The Tata Power Company Limited Corporate Engineering-Quality Assurance Inspection & Testing				TATA
TPQAIT-QAXX-00-EX-SQP-072 REV.0	STANDARD QUALITY PLAN FOR INDOOR MEDIUM VOLTAGE SWITCHGEAR (3.3KV TO 33KV)				Date of Issue:
Sr. No	COMPONENT / OPERATION		CHARACTERISTICS CHECKED	TYPE / METHOD OF CHECK	REMARKS
1	2		3	4	5
1.0	MATERIAL:	(Generally in-line with manufacturer standard / technical specification)			
1.1	Sheet Metal	1	Verification of raw material properties, dimension check, Mechanical, Electrical & Chemical Properties.	Test to be carried out by material / component supplier.	All items TCs to be reviewed by main supplier. (The TCs for CT, PT, Relay, interrupter, MFM are to be submitted to TATAPOWER as per requirement.)
1.2	Copper bus bar	2	Purity of copper, conductivity, hardness,		
1.3	Interrupter	1	Contact Resistance	Test to be carried out by material /component supplier as per IS-13118/ IEC 62271-100 & 200	
		2	Vacuum bottle routine test		
		3	HV & IR test Test		
		4	Mechanical endurance test		
		5	Electrical endurance tests		
1.4	CT	1	CT Ratio, Polarity, kpV, ISF, Accuracy	Test to be carried out by material / component supplier as per IS 2705/ IEC 60044	
		2	HV & IR test Test		
		3	PD Test		
		4	Secondary Resistance		
		5	Interturn Insulation test		
1.5	PT	1	PT Ratio, Polarity,	Test to be carried out by material / component supplier as per IS 4146/ IEC 60044	
		2	Secondary Induced Voltage Test		
		3	HV Test & IR test		
		4	PD Test		
		5	Primary and Secondary Resistance		
1.6	Multi Function Meter (MFM)	1	Performance & Accuracy	Test to be carried out by material / component supplier	
		2	Dimension		
		3	Make Type Rating		
		4	2 kV HV test		
		5	IEC 61850 Compatibility		
1.7	Relay	1	Performance & Functional Checks	Test to be carried out by material / component supplier	
		2	Make, Type, Rating		
		3	2 kV HV test		
		4	IEC 61850 Compatibility		
1.8	Insulator	1	As per IS-731/5621, IEC 575, IEC 60233	Test to be carried out by material/component supplier	
2.0	INPROCESS INSPECTION: (Generally inline with manufacturing plan)				
1.0	Panel Fabrication	1	Dimensional Conformity, Bend Angle, Profile, Deburring & welding finish, slag removal.	Checks/tests to be carried out by main supplier	Verification of Records by TATA POWER.
		2	Surface preparation		
		3	Surface Finish, Paint Shade, Finishing, Coating thickness.		
4.0	Panel Assembly test	1	Functional tests,		
		2	Scheme checks		
		3	Clearance checks		
		4	HV & IR on power and control circuit.		
		5	Conformance to the GA drawing.		
		6	Tinning/ silver coating verification of bus bar joint		
		7	Contact Resistance of bus bar joint		
		8	Measurement of tightness of bus bar joints by torque wrench.		
3.0	FINAL INSPECTION: (As per approved GA, data sheet, wiring diagram, QAP & IEC 62271-100 &200/ IEC 60694)				
3.1	Routine tests	1	Visual & dimensional Check including layout, tag plates, paint shade, paint thickness, bus markings and sleeving, Joint shrouding of bus bar, clearance checks, creepage distance checks, maintenance accessibility, door alignment, IP class, lifting arrangement, earthing point, surface finish etc	Testing & Measurement as per IEC 60694/IEC 62271-100 &200	Customer Hold Point (CHP)
		2	Bill of material checks (Make, rating, Name plates etc.)		
		3	Interchange ability of identical modules / Feeders and rack-in and out operation.		
		4	Verification of bus bar support arrangements with respect to type tested panel drawings, provision of external cable termination and bus duct as applicable.		
		5	Wiring checks for control and auxiliary equipments circuits and aux. contacts		
		6	Measurement of tightness of bus bar joints by torque wrench.		
		7	Relay operation checks through secondary injection.		
		8	Insulation Resistance of main, aux. and control circuits before and after HV test		

TATA POWER	The Tata Power Company Limited Corporate Engineering-Quality Assurance Inspection & Testing	TATA
TPQAIT-QAXX-00-EX-SQP-072 REV.0	STANDARD QUALITY PLAN FOR INDOOR MEDIUM VOLTAGE SWITCHGEAR (3.3KV TO 33KV)	Date of Issue:

Sr. No	COMPONENT / OPERATION		CHARACTERISTICS CHECKED	TYPE / METHOD OF CHECK	REMARKS
1	2		3	4	5
	Routine tests	9	Visual as well as operational checks for Panel indications, annunciations, any analog monitoring devices such as Ammeter, Voltmeter or Energy meter	Testing & Measurement as per IEC 60694/IEC 62271-100 &200	Customer Hold Point (CHP)
		11	HV test on power and control circuit.		
		12	Communications checks between relay and data concentrator / HMI, if applicable		
		13	Electrical operation test at control (auxillary) voltage-(Clause no IEC62271-200- 7.102)		
		13.1	5 Close and 5 Open operation at 110% of Rated control Voltage.		
		13.2	5 Close and 5 Open operation at 100% of Rated control Voltage.		
		13.3	5 Close operation at 85% of Rated control Voltage.		
		13.4	5 Open Operation at 70% of Rated control Voltage.		
		13.5	5 CO Operation at 100% of Rated control Voltage.		
		14	Measurement of insulation resistance of Circuit Breaker in closed, open position.		
		15	Measurement of milli-volt drop across Circuit Breaker main contacts, other joints and also across bus bar joint.		
		16	Measurement of resistance, IR value and drop-off/pick-up voltage of close and trip coils		
		17	Healthiness of limit switch contacts		
		18	Spring charging motor functional checks		
		19	Operational checks of all control functions and interlocks as per schematic drawings in service and test conditions.		
		20	Measurement of CT/PT polarity, ratio, secondary resistance and knee point voltage from terminal block.		
		21	Secondary injection of all metering circuits.		
		22	HMI operational and functional checks, if applicable		
		23	Shutter assembly interlock check and safety barrier operation check.		
3.2	Type Tests	1	Short circuit making and breaking tests	Testing & Measurement as per IEC 62271-200/ IEC 60694 standard). Will be conducted as per mutual agreement between supplier and customer	Valid TYPE tests certificate not older than 5 year is prerequisite.
		2	Rated Short Time current withstand & peak withstand test.		
		3	Temperature Rise Test on bus bar and component contained in the metal enclosed switchgear.		
		4	Degree of protection of panels.		
		5	Lighting Impulse voltage test.		
		6	Electromagnetic compatibility (EMC).		
		7	Partial discharge test.		
		8	Internal Arc withstand test.		
		9	Any other special / type test as per technical specifications.		
	Any Separate Type/ Design validation tests shall be carried out in accordance with TATA POWER specification/ PO or as per mutually agreed in MQP.				
4.0	PACKING, PRE-SHIPMENT & DISPATCH:				
4.1	PACKING & PRE-SHIPMENT.	1	Visual Verification.	Measurement & Visual.	
		2	Packing in cartons.		
		3	Quantity Verification.		
		4	Identification.		
4.2	DISPATCH.		Issue of Release note / MDCC.	Customer Hold Point.	

NOTE

A) ALL MATERIAL SHALL BE AS PER APPROVED DRAWING/ DATA SHEET.
B) STATUTORY REQUIREMENTS WILL BE COMPLIED BY THE CONTRACTOR.
C) TATA POWER / ITS REP IDENTIFICATION STAMP ON MATERIALS WILL BE PRESERVED, IF REQD, SAME SHALL BE TRANSFERRED BY TATA POWER / ITS REP ONLY FOR MATERIAL TRACEBILITY.
D) FINAL INSPECTION OF THE MAJOR ACTIVITIES ARE WITTNESSED BY CLIENT AND IT IS HOLD POINT (AT THE DISCRETION TATA POWER)
E) MANUFACTURER SHALL PREPARE AND SUBMIT COMPLETE MANUFACTURING QUALITY PLAN IN PRESCRIBED FORMAT OR THEIR REGULAR FORMAT INDICATING THEIR REGULAR PRACTICES, TAKING CARE OF MINIMUM REQUIREMENT AS INDICATED ABOVE.
F)INSPECTION OF THE MAINTAINCE SPARES SHALL BE OFFERED ALONG WITH THE MAIN SUPPLY AS PER THE INSPECTION STAGES OF 1 TO 4.
G)CALIBRATION CERTIFICATES OF THE EQUIPMENT USED FOR TESTING SHALL BE PROVIDED FOR REVIEW.
H)TATA POWER RESERVES THE RIGHT TO DEMAND / VERIFY/ AUDIT/ WITNESS ANY OF THE CHECK POINTS MENTIONED IN THE SCOPE OF SUPPLIER.
I) AS PER SPECIFICATION PROPER PAINTING & PACKING SHALL BE ENSURED BY VENDOR BEFORE SHIPMENT TO AVOID ANY TRANSIT DAMAGE.

Meant for (Internal Circulation / External – Stakeholders Circulation)

SECTION C

C1 - SCHEDULE OF QUANTITIES & PRICES

Bidder to quote with scope : Design, Detail Engineering, Manufacturing and Testing at Manufacturer's works, packing and Supply, transport, insurance during transit, delivery in good condition at site, storage, preservation at site, handling at site, Erection, Testing after Erection, commissioning, performance testing and handing over of all equipment's as per scope detailed in the bid document, for all the following

Item	Description	UOM	Qty	Ex-work price	Taxes	Total Price
1	Civil work	NA				
2	SITC of 11 kV AIS Switchgear for U#2, U#5 & BPSU.	1	**Lumsum**			
3	SITC of Control, Protection and Automation (Separate panel for BPSU Switchgear Panels)	1	**Lumsum**			
4	Supply & Installation of 11kV Cables with Terminations.	NA				
5	Supply & Installation of LT Control & Power Cables with Terminations.	NA				
6	Supply of Spares as indicated in Specifications.	1	**Lumsum**			
7	Extended Warranty	1	**Lumsum**			
8	Statutory Approvals	1	**Lumsum**			

Scope for extended warranty

Item	Description	UOM	Qty	Ex-work price	Taxes	Total Price
9	AMC costs	Lumpsum (cost for 05 years)	1			

	Grand Total					
	GST					
	Grand Total Incl Taxes					
	Grand Total Incl Taxes (In words)					

Seal of the Company

Signature

Date

Name

Designation

NOTE

1	**Any other item and accessories not specified above but necessary to complete the 11kV Switchgear commissioning has to be provide by Bidder. A separate list with rate and cost of the same shall be provided by Bidder.**
2	**Bidder to considered following points for sucessful commisioning of compelete project:**
a	**These rates shall be inclusive of lodging, boarding, living expenses, local transport and to and fro air fares.**
b	**These rates shall remain unaltered till the commissioning of the complete switchgear and associated equipment.**
c	**Normal rates shall be applicable for working 48 hours a week, spread over six (6) days, depending on site progress. Transport time from accommodation to site and back will not be considered, as part of working time.**
d	**Total payment shall be based on actual number of days worked (excluding holidays & Sundays).**
e	**Foreign currency and Indian currency components of rates quoted for supervision shall be indicated.**
f	**The Bidder shall indicate in detail the estimated duration of supervision of erection and commissioning for equipment**
3	**Bidder has to consider the expenses of to and fro air fare, lodging-boarding charges and local transport charges of 4 persons for training at Manufacturer's works. Training program shall cover all relevant items including training of O&M and carrying out necessary repair works. Duration to be considered for at least 8 man days of training for each package.**

In addition to above Bidder to submit price break-up for Following equipment/system/Packege.

EPC for 11kV AIS Replacement at Bhira Hydro Station:Tentative BOQ-R0

Item	Description	UOM	Qty
B2.1	**GENERAL CIVIL WORKS**	**NA**	
B2.2	**SITC of 11 kV AIS Switchgear for U#2, U#5 & BPSU. (ENGG/ELEC/STD-SPEC/2018/48))+Refer Annexure-3 for billing break-up**	**Lot**	**1**
B2.3	**SITC of Control, Protection and Automation (Separate panel for BPSU Switchgear Panels). (ENGG/ELECT/STD-SPECS/70)+Refer Annexure-4 for billing break-up.**	**Lot**	**1**
B2.4	**SITC OF STATION AUTOMATION SYSTEM Refer Annexure-5 for billing break-up**	**Lot**	**1**
B2.5	**SITC OF COMMUNICATION SYSTEM Refer Annexure-6 for billing break-up**	**Lot**	**1**
B2.6	**SITC OF BALANCE OF PLANT (TE00578/SP/0017/FY/26)+Refer Annexure-7 for billing break-up**		
B2.5.1	Miscellaneous Support Structures and fixtures for all equipment	LOT	1
B2.5.2	Miscellaneous ITEMS-SAFETY EQUIPMENT, BOARDS, LOTO ETC.	LOT	1

Scope for extended warranty

Item	Description	UOM	Qty
B2.7	Scope of works for activities under extended warranty:11kV Switchgear & Relay control Panel	Lumpsum (cost for 05 years)	1

Scope for Statutory approvals

Item	Description	UOM	Qty
B2.8	Statutory Electrical inspectors' approval for all electrical installations under the project: required for installation, commissioning and load service of new 11kV Bhira AIS project	Lumpsum	1

	Grand Total		
	GST		
	Grand Total Incl Taxes		
	Grand Total Incl Taxes (In words)		

C2 - PROJECT TIME SCHEDULE

Bidders to attach copy of Project schedule		Month-1		Month-2		Month-3		Month-4		Month-5		Month-6		Month-7		Month-8		Month-9		Month-10		Month-11		Month-12	
Sr No	**Tendering +PO**	1st - 2nd Week	3rd- 4th week	1st - 2nd - Week	3rd- 4th week	1st - 2nd Week	3rd- 4th week	1st - 2nd - Week	3rd- 4th week	1st - 2nd Week	3rd- 4th week	1st - 2nd - Week	3rd- 4th week	1st - 2nd - Week	3rd- 4th week	1st - 2nd Week	3rd- 4th week	1st - 2nd - Week	3rd- 4th week	1st - 2nd - Week	3rd- 4th week	1st - 2nd - Week	3rd- 4th week	1st - 2nd - Week	3rd- 4th week
1	PO PLACEMENT																								
2	Drawing submission after PO placement																								
3	Drawing approvals after PO placement (Drawings will be approved as per sequence of activity)																								
4	Manufacturing of 11 kV AIS + CRP Panel																								
5	Delivery of 11 kV AIS + CRP Panel Items etc.																								
6	Installation & Test charging of 11 kV AIS bays, CRP Panel & associated Equipment.																								
7	Handover																								

Seal of the Company

Signature

Date

Name

Designation

Note: The bidder shall indicate schedule of milestones and also attach/furnish a detailed bar chart identifying customer inputs.

C3- SCHEDULE OF DEVIATIONS FROM TECHNICAL SPECIFICATIONS

All deviations from this specification, shall be set out by the Bidders, indicating clause no and page in this schedule. Unless ***specifically*** mentioned in this schedule, the tender shall be deemed to conform to the purchaser's specifications:

S No	Clause No	Details of Deviations with Justifications

We confirm that there are no deviations apart from those detailed above.

AMC costs

Seal of the Company

Signature

Date

Name

Designation

C4- SCHEDULE OF DEVIATIONS FROM GENERAL & SPECIAL CONDITIONS OF CONTRACT

All deviations from this specification, shall be set out by the Bidders, indicating clause no and page in this schedule. Unless ***specifically*** mentioned in this schedule, the tender shall be deemed to conform to the purchaser's specifications:

S No	Clause No	Details of Deviations with Justifications

We confirm that there are no deviations apart from those detailed above.

AMC costs

Seal of the Company

Signature

Date

Name

Designation

C5- SCHEDULE OF DRAWINGS & DOCUMENT SUBMISSION				
S No	Title of Drawing / Document	Target Date of Submission	For Information / Review / Approval	Remarks
1.0	Signed copy of bid document as a token of acceptance			
2.0	Dully filled in schedules, listed in section 'C'. i.e. Schedule C1 to C9 – Attached			
3.0	Qualifying Requirement filled in excel sheet – Attached as Annexure 1			
4.0	Quality Assurance Plan (QAP), Manufacturing Quality Plan (MQP), Field Quality Plan (FQP) as applicable.			
5.0	General Arrangement Drawings for equipment offered – AIS floor plan and section drawing in pdf and Auto Cad format			
6.0	Filled up Data Sheets for 11kV AIS, Control, Relay & Protection Panel in excel sheet – Attached as Annexure			
7.0	Type Test Reports as applicable.			
8.0	Project Schedule			
Seal of the Company			Signature	
Date			Name	
			Designation	

Note: The titles of drawings / documents listed out in the schedule are examples. The bidder shall list out all relevant drawings / documents.

C6- SCHEDULE OF RECOMMENDED SPARES

As part of the proposal, the BIDDER shall indicate below the list of recommended spares for three years of trouble free operation of the equipment/system offered by him for individual equipment.

Sr. No.	Equipment tag no	Description of spare	Material of construction	Part no	Quantity recommended per unit of equipment	Unit price	Total price	Delivery period from date of LOI	Remarks

Seal of the Company

Signature

Date

Name

Designation

C7 - SCHEDULE OF SPECIAL ERECTION/MAINTENANCE TOOLS & TACKLES

As part of the proposal, the BIDDER shall indicate below, the list of erection/maintenance tools & tackles offered by him for individual equipment.

Sr. No.	Description of spare	Quantity recommended per unit of equipment	Unit price	Total price	Delivery period from date of LOI	Remarks
Seal of the Company						Signature
Date						Name
						Designation

C8 - SCHEDULE OF PLACES OF MANUFACTURE, TESTS AND INSPECTION		
For major equipment / systems, the Bidder shall indicate the name of the Manufacturer / SUBCONTRACTOR and place of test and inspection		
ITEM OF EQUIPMENT	Manufacturer / SUBCONTRACTOR	PLACE OF TESTING & INSPECTION
Seal of the Company		Signature
Date		Name
		Designation

C9- SCHEDULE OF MANDATORY SPARES

The Bidder shall indicate the price for the mandatory spares specified in Section-A of individual equipment

Sr. No.	Equipment tag no.	Description of spare	Material of construction	Part no	Quantity included per unit of equipment	Unit price	Total price	Delivery period from date of LOI	Remarks

Seal of the Company

Signature

Date

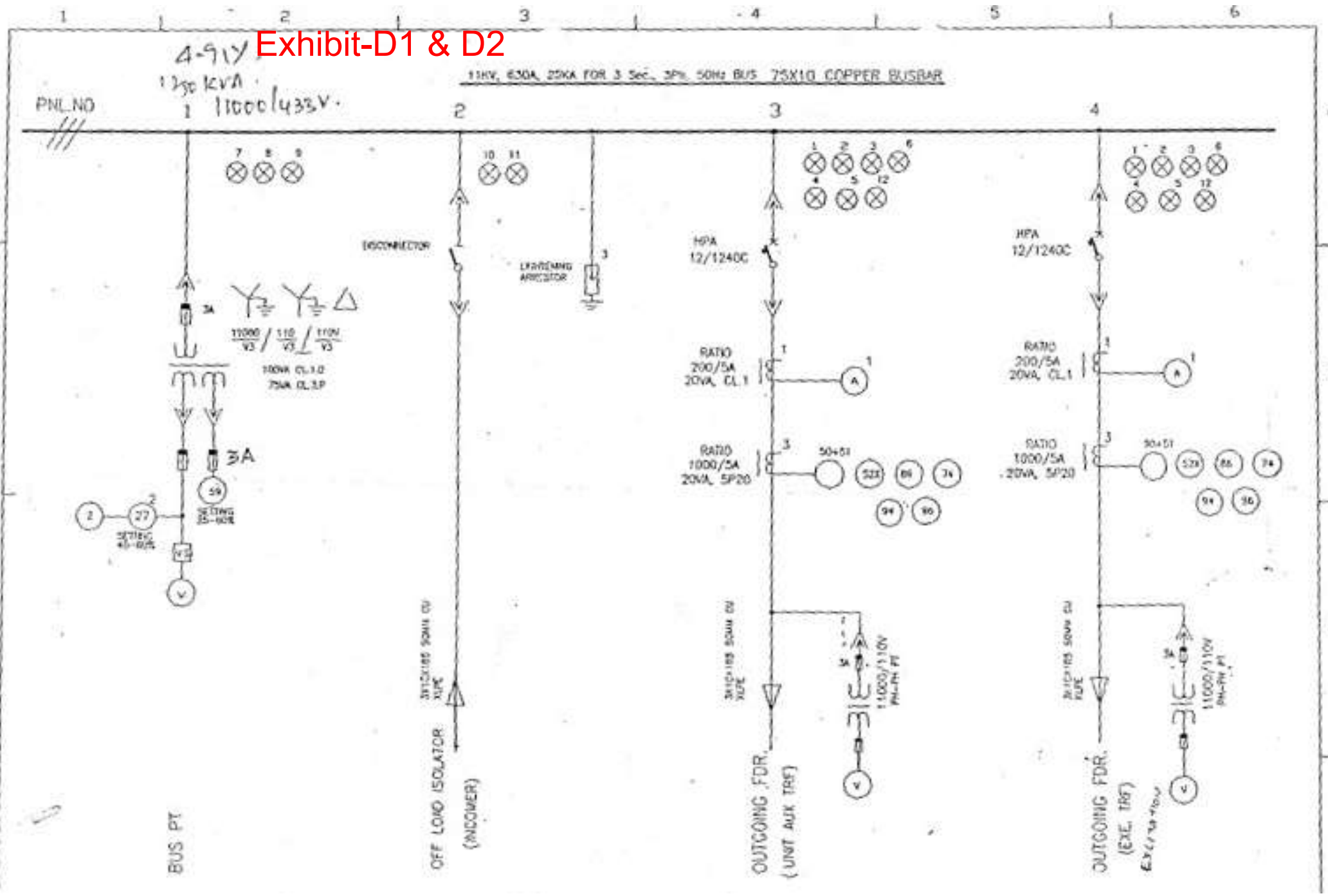
Name

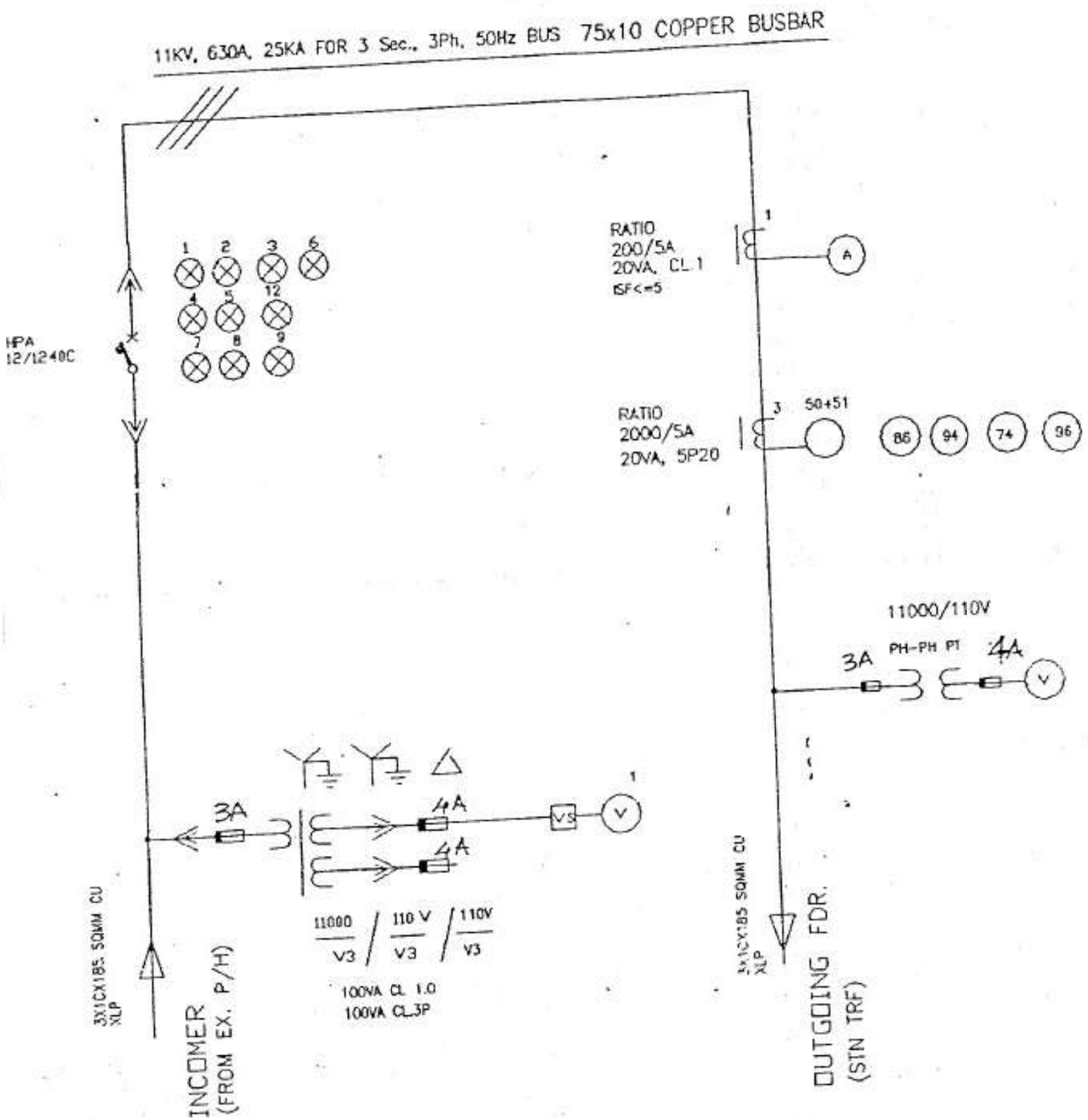
Designation

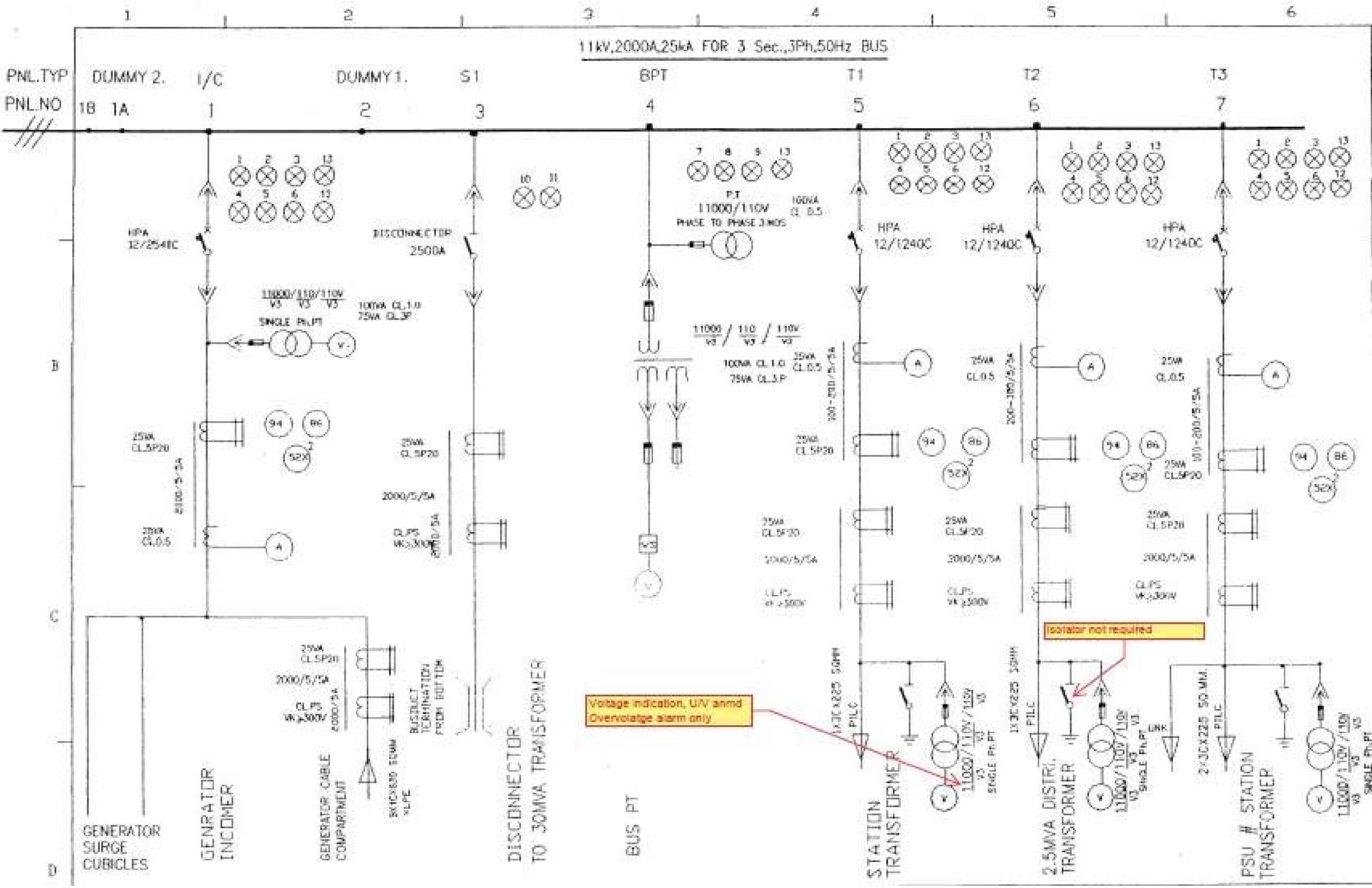
Document No. TE00606/SP/0039/FY26 Rev: A Date:10/02/2026	**Specification for Replacement of 11kV AIS at Bhira PH-2, 5 and BPSU Unit.**	

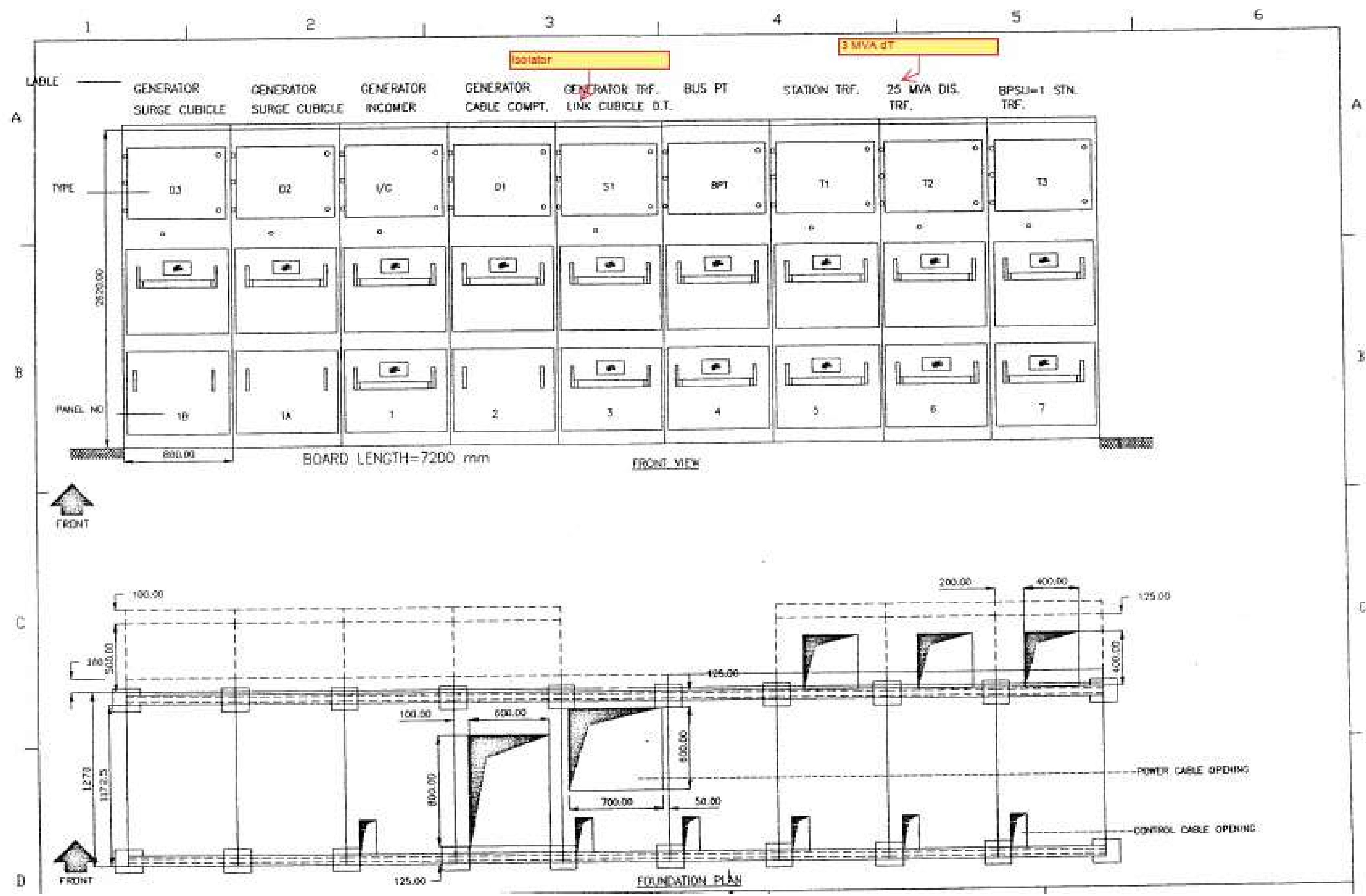
SECTION D

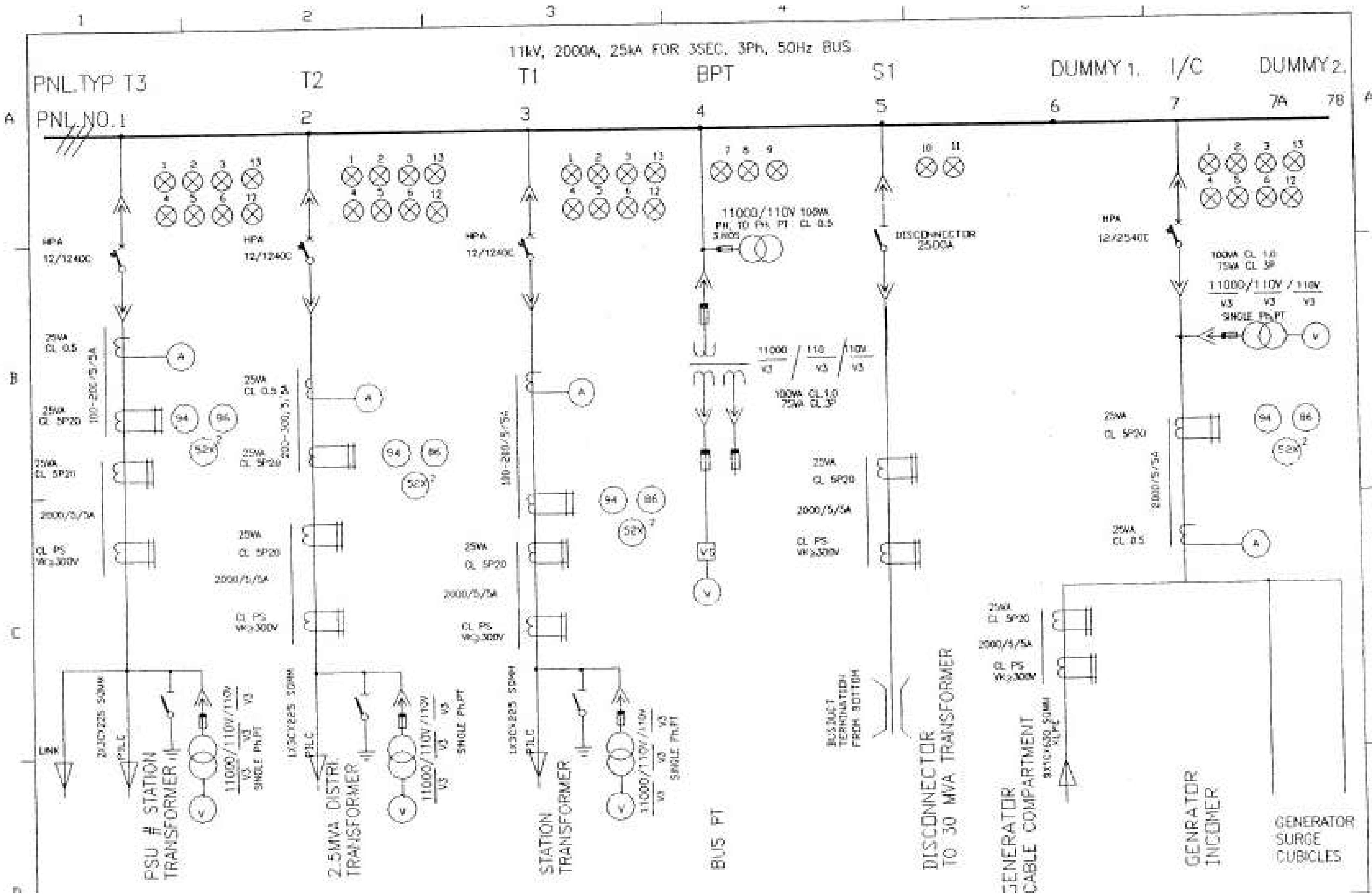
Exhibit-D1 & D2

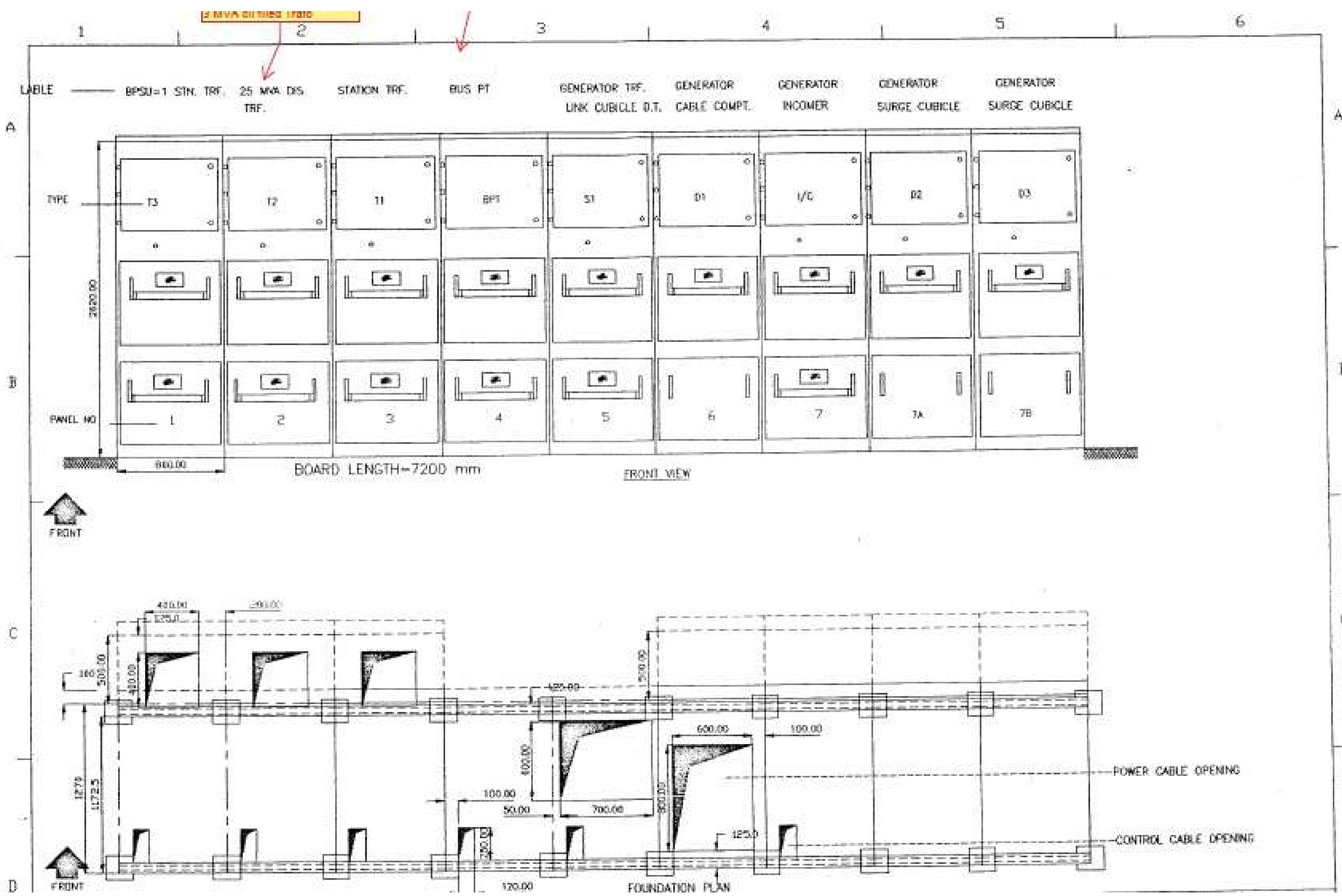



11KV, 630A, 25KA FOR 3 Sec., 3Ph, 50Hz BUS 75x10 COPPER BUSBAR
HPA
12/1240C
RATIO
200/5A
20VA, CL.1
ISF<=5
RATIO
2000/5A
20VA, 5P20
50+51
86
94
74
96
11000/110V
PH-PH PT
3A
4A
V
3A
4A
4A
V3
V
11000/V3 / 110V/V3 / 110V/V3
100VA CL 1.0
100VA CL 3P
3X1CX185 SQMM CU XLP
INCOMER
(FROM EX. P/H)
3X1CX185 SQMM CU XLP
OUTGOING FDR.
(STN TRF)


11kV,2000A,25kA FOR 3 Sec.,3Ph,50Hz BUS
PNL.TYP
PNL.NO
DUMMY 2.
I/C
DUMMY 1.
S1
BPT
T1
T2
T3
HPA 12/2541C
DISCONNECTOR 2500A
HPA 12/1240C
PT 11000/110V PHASE TO PHASE 3 NOS
100VA CL 0.5
SINGLE Ph.PT
100VA CL.1.0 75VA CL.3P
25VA CL.5P20
2000/5/5A
25VA CL.0.5
CL.PS VK≥300V
100-200/5/5A
200-100/5/5A
Isolator not required
Voltage indication, U/V anmd Overvolatge alarm only
PILC
LINK
2X3CX225 SQ.MM.
GENERATOR SURGE CUBICLES
GENRATOR INCOMER
GENERATOR CABLE COMPARTMENT
BUSDUCT TERMINATION FROM BOTTOM
DISCONNECTOR TO 30MVA TRANSFORMER
BUS PT
STATION TRANSFORMER
2.5MVA DISTRI. TRANSFORMER
PSU # STATION TRANSFORMER

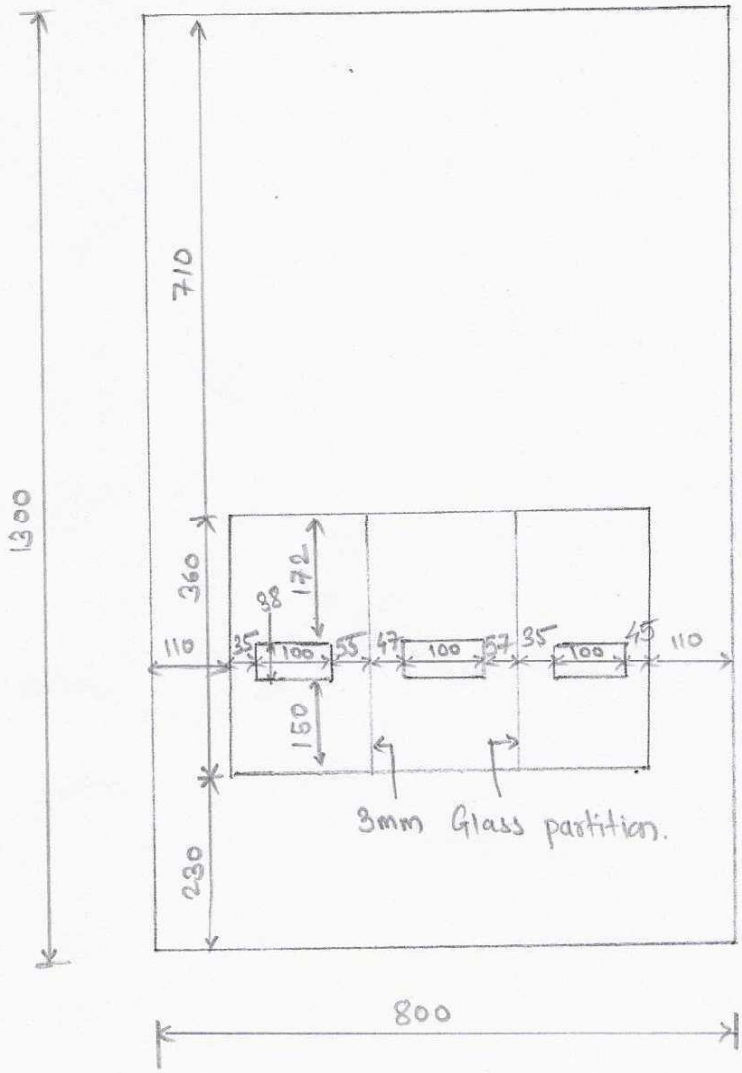

Isolator
3 MVA dT
LABLE
GENERATOR SURGE CUBICLE
GENERATOR SURGE CUBICLE
GENERATOR INCOMER
GENERATOR CABLE COMPT.
GENERATOR TRF. LINK CUBICLE D.T.
BUS PT
STATION TRF.
25 MVA DIS. TRF.
BPSU-1 STN. TRF.
TYPE
D3
D2
I/C
D1
S1
BPT
T1
T2
T3
PANEL NO
1B
1A
1
2
3
4
5
6
7
2620.00
800.00
BOARD LENGTH=7200 mm
FRONT VIEW
FRONT
100.00
500.00
300
200.00
400.00
125.00
400.00
125.00
100.00
600.00
800.00
600.00
700.00
50.00
1270
1172.5
POWER CABLE OPENING
CONTROL CABLE OPENING
125.00
FOUNDATION PLAN
FRONT


11kV, 2000A, 25kA FOR 3SEC, 3Ph, 50Hz BUS
PNL.TYP T3
PNL.NO.1
T2
T1
BPT
S1
DUMMY 1.
I/C
DUMMY 2.
HPA 12/1240C
HPA 12/2540C
DISCONNECTOR 2500A
11000/110V 100VA PH. TO PH. PT CL 0.5
100VA CL 1.0 75VA CL 3P
SINGLE Ph.PT
25VA CL 0.5
25VA CL 5P20
2000/5/5A
CL PS VK≥300V
100-200/5/5A
200-300/5/5A
LINK
PILC
2X3CX225 SQMM
1X3CX225 SQMM
PSU # STATION TRANSFORMER
2.5MVA DISTRI TRANSFORMER
STATION TRANSFORMER
BUS PT
BUSDUCT TERMINATION FROM BOTTOM
DISCONNECTOR TO 30 MVA TRANSFORMER
GENERATOR CABLE COMPARTMENT
9X1CX630 SQMM XLPE
GENRATOR INCOMER
GENERATOR SURGE CUBICLES


3 MVA oil filled Trafo
LABLE
BPSU=1 STN. TRF.
25 MVA DIS. TRF.
STATION TRF.
BUS PT
GENERATOR TRF. LINK CUBICLE D.T.
GENERATOR CABLE COMPT.
GENERATOR INCOMER
GENERATOR SURGE CUBICLE
GENERATOR SURGE CUBICLE
TYPE
T3
T2
T1
BPT
S1
D1
I/C
D2
D3
PANEL NO
1
2
3
4
5
6
7
7A
7B
2620.00
800.00
BOARD LENGTH=7200 mm
FRONT VIEW
FRONT
400.00
125.0
200.00
500.00
400.00
425.00
250.00
600.00
100.00
400.00
800.00
100.00
50.00
700.00
250.00
125.0
120.00
1279
1172.5
POWER CABLE OPENING
CONTROL CABLE OPENING
FOUNDATION PLAN
FRONT

11KV Bus-2, GT bus duct

front side

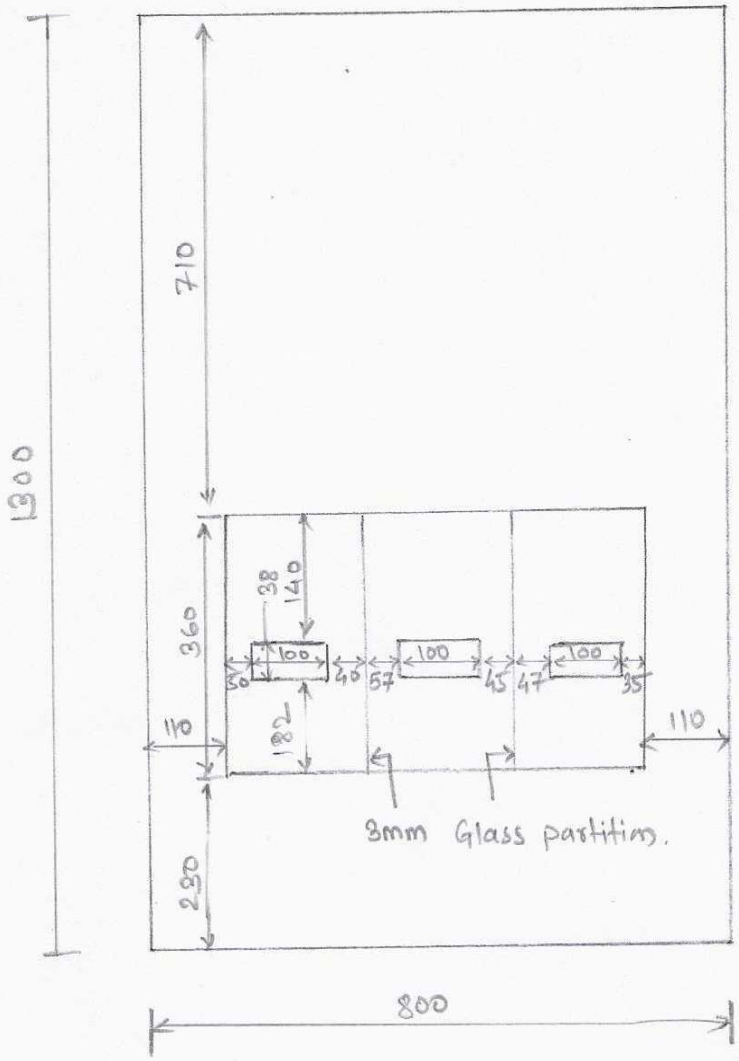


Back Side.

* All dimensions are in mm.
* size of bus bar from GT - 3x100mm x 6mm
* Size of bus bar from switchgear - 3x75 mm x10 mm

11 KV Bus-5 GT bus duct

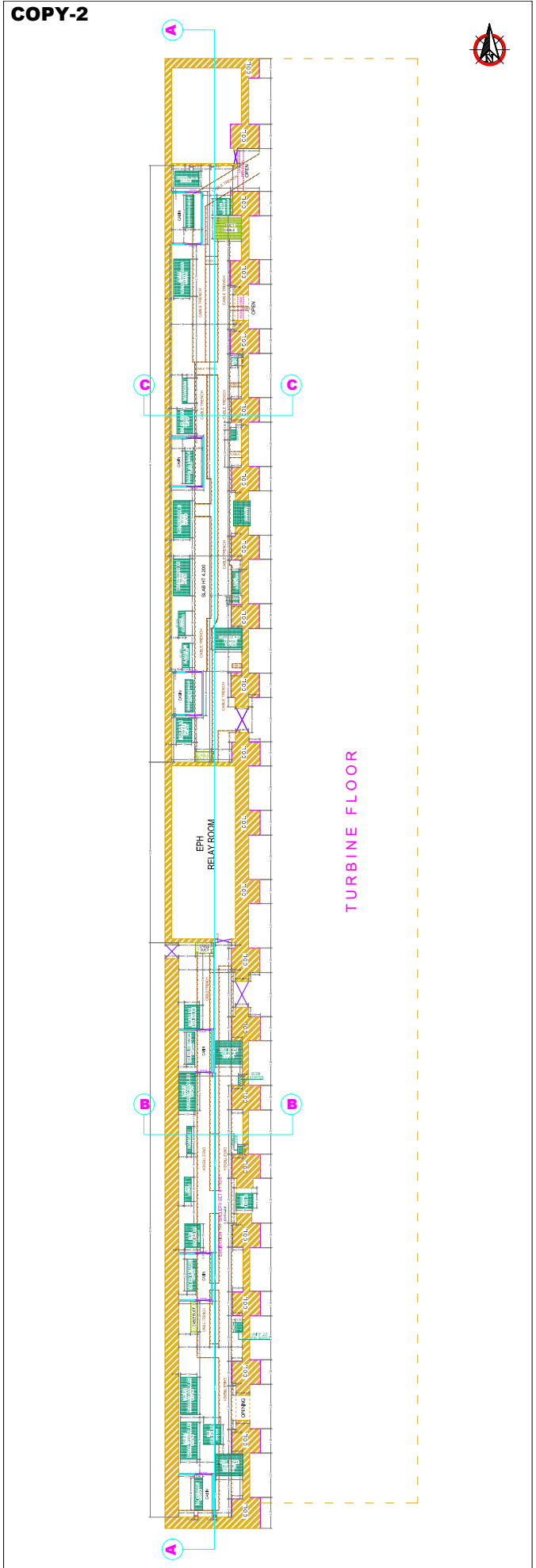
front side.



Back side.

* All dimensions are in mm.
* Size of bus bar from GT - 3 x 100 mm x 6 mm
* Size of bus bar from switchgear - 3 x 75 mm x 10 mm

COPY-2



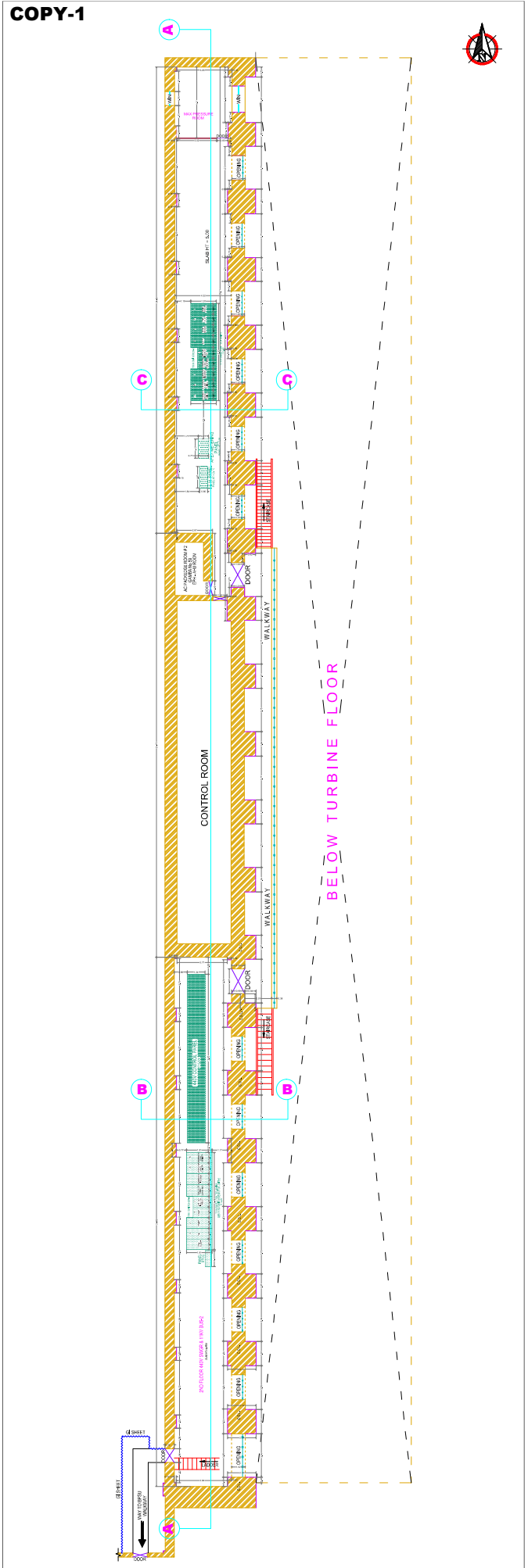
1ST FLOOR EXCITATION TRF GALLERY SET # 1TO 3 &
EXCITATION PANEL SET # 4, 5 & 6

SCALE (1:1000)

NOTE : ALL DIMENSIONS AND LEVELS ARE IN METERS.

THE TATA POWER CO LTD	
EHRA POWER HOUSE	
SURVEY PLAN OF 1ST FLOOR EXCITATION TRF GALLERY SET # 1 TO 3 & EXCITATION PANEL SET # 4, 5 & 6 AT EHRA	
M/s MUDIRAJ & BHUSHAN ENTERPRISES.	
SURVEYED & DRAWN BY	CHECKED BY
DATE : 10-03-2023	
SCALE : 1:1000	
DRG NO: R2	
MBE : 6000	

COPY-1



2ND FLOOR 440V SWGR & 11KV BUS-2 & 11KV SWITCH GEAR BUS - V ROOM

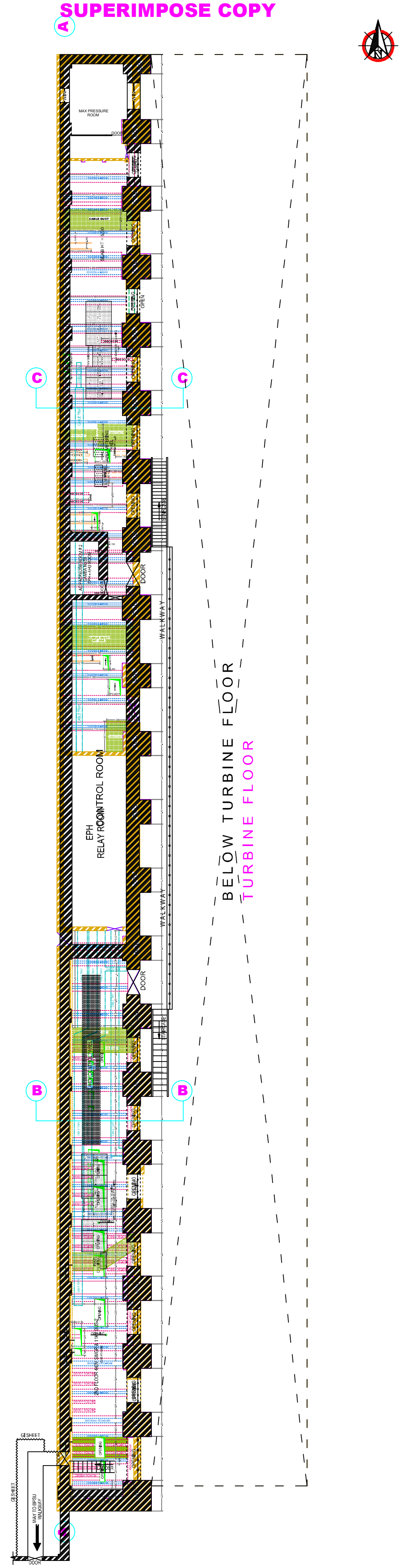
SCALE {1:1000}

NOTE : ALL DIMENSIONS AND LEVELS ARE IN METERS.

THE TATA POWER CO LTD BHIRA POWER HOUSE	
SURVEY PLAN OF 2ND FLOOR 440V SWGR & 11KV BUS-2 & 11KV SWITCH GEAR BUS - V ROOM AT BHIRA	
M/s MUDRAJ & BHUSHAN ENTERPRISES.	
SURVEYED & DRAWN BY	CHECKED BY
DATE : 10-03-2023 SCALE : 1:1000 DRG NO: R2 MBE : 6000	

COPY-4

SUPERIMPOSE COPY

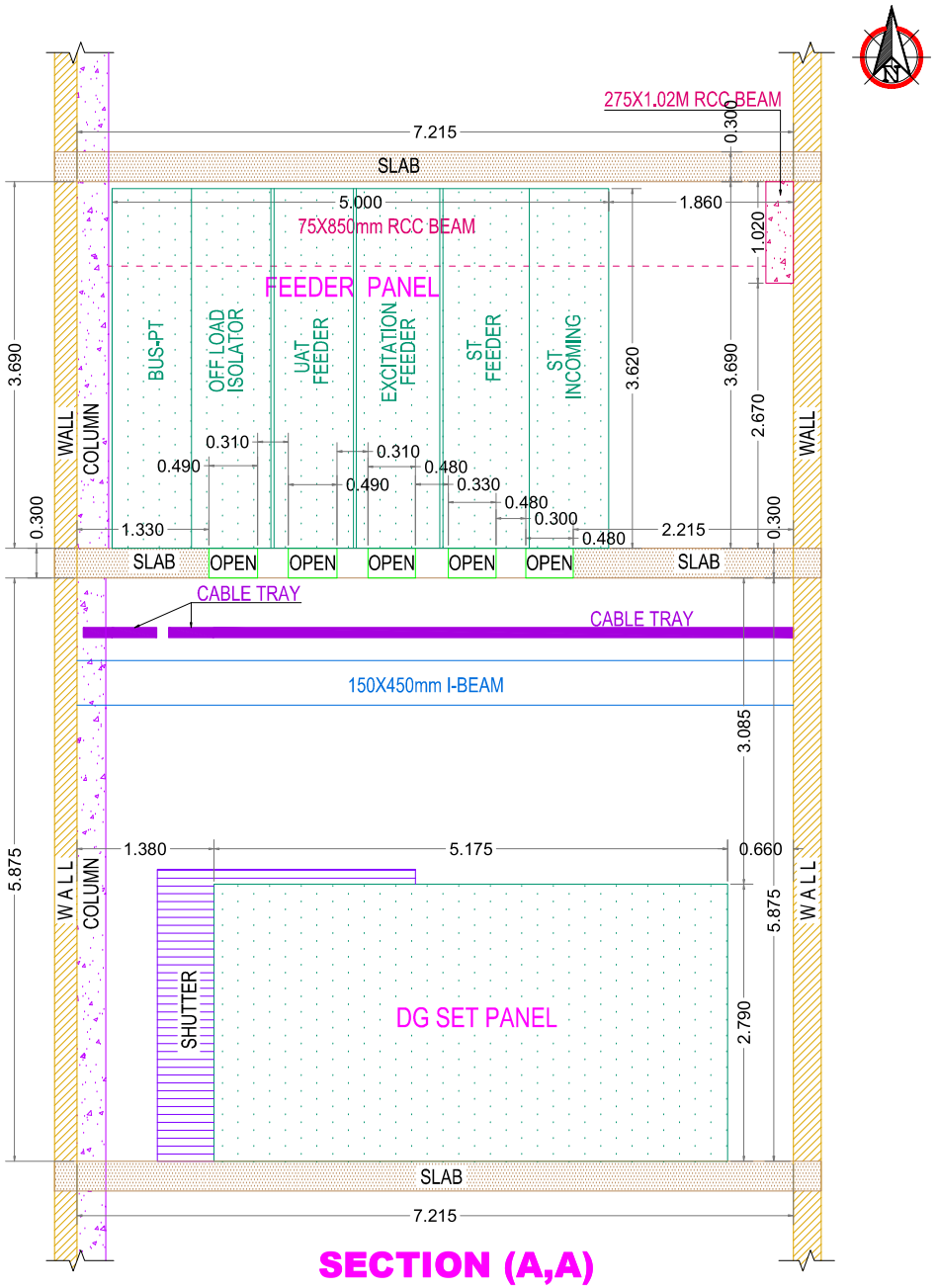


2ND FLOOR SUPERIMPOSE ON 1ST FLOOR

SCALE (1:1000)

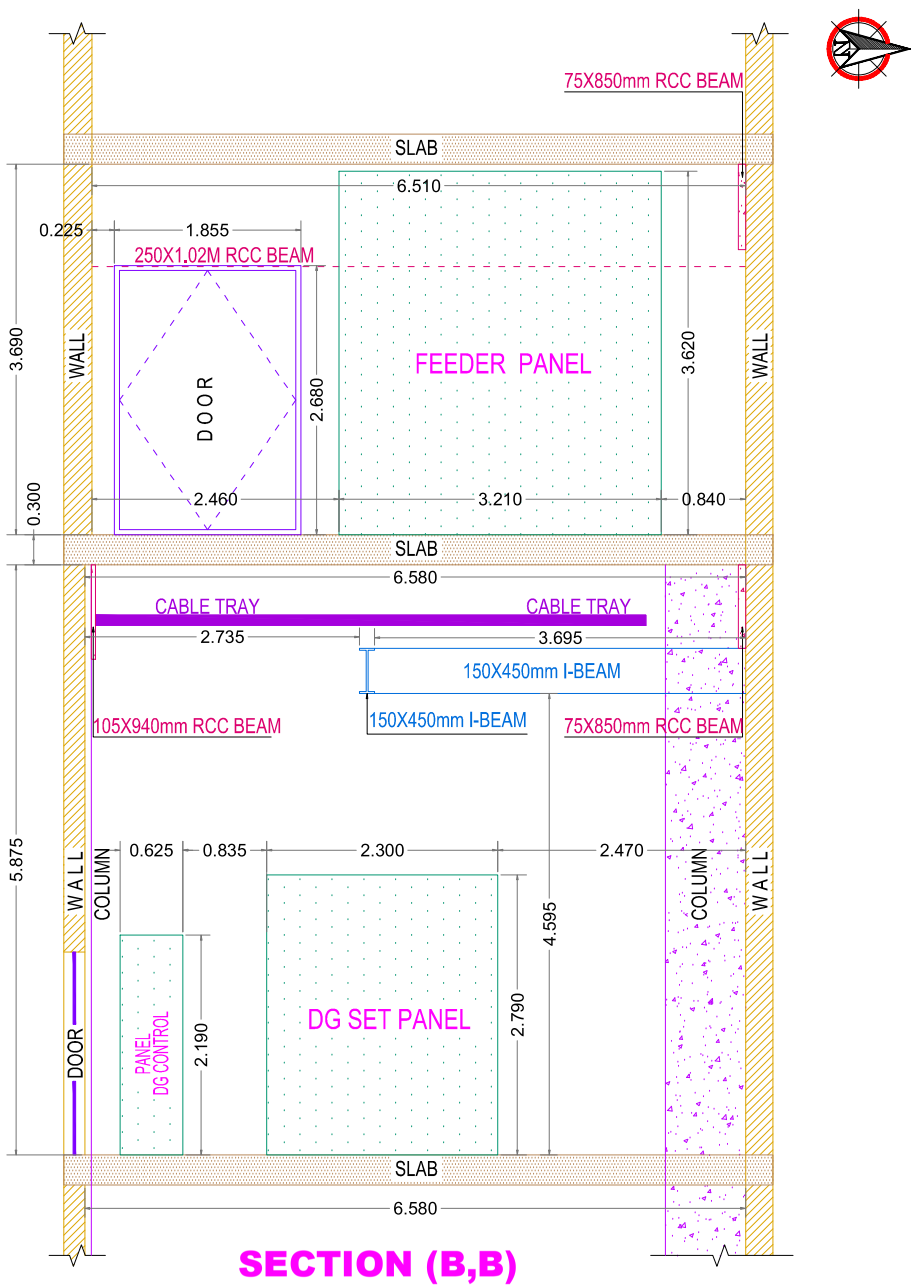
NOTE : ALL DIMENSIONS AND LEVELS ARE IN METERS.

THE TATA POWER CO LTD BHIRA POWER HOUSE		
2ND FLOOR SUPERIMPOSE ON 1ST FLOOR		
M/s MUDIRAJ & BHUSHAN ENTERPRISES.		
SURVEYED & DRAWN BY	CHECKED BY	DATE : 18-06-2025
		SCALE : 1:1000
(MUDIRAJ.&BHUSHAN.)		DRG NO: R1(26-11-25)
		MBE / 0000



SECTION (A,A)

SCALE {1:1000}

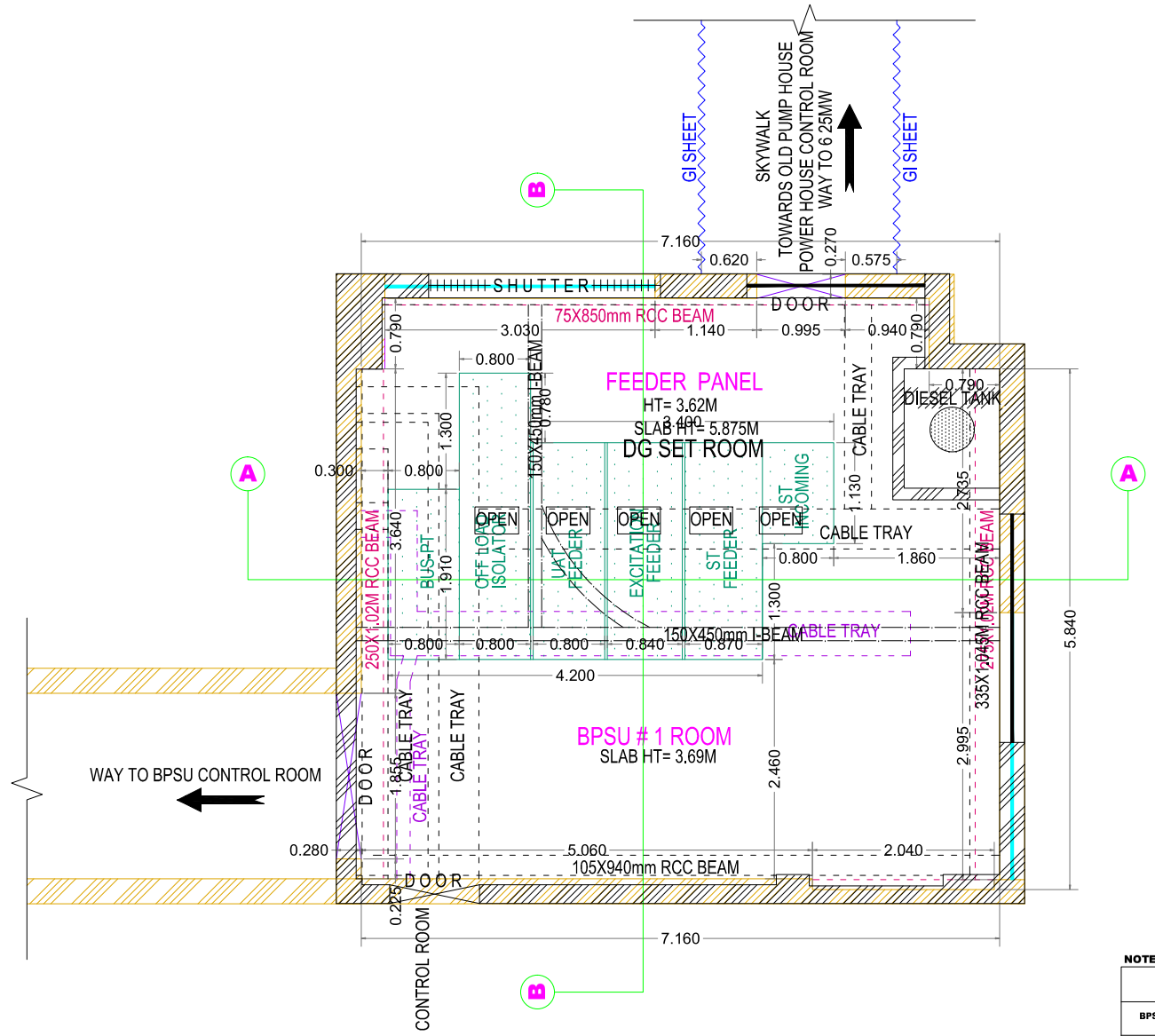


SECTION (B,B)

SCALE {1:1000}

SUPERIMPOSE COPY

COPY-1



LEGEND:-

WALL
OPENING
DOOR
WINDOW
STAIRCASE
PANEL
BEAM
COLUMN

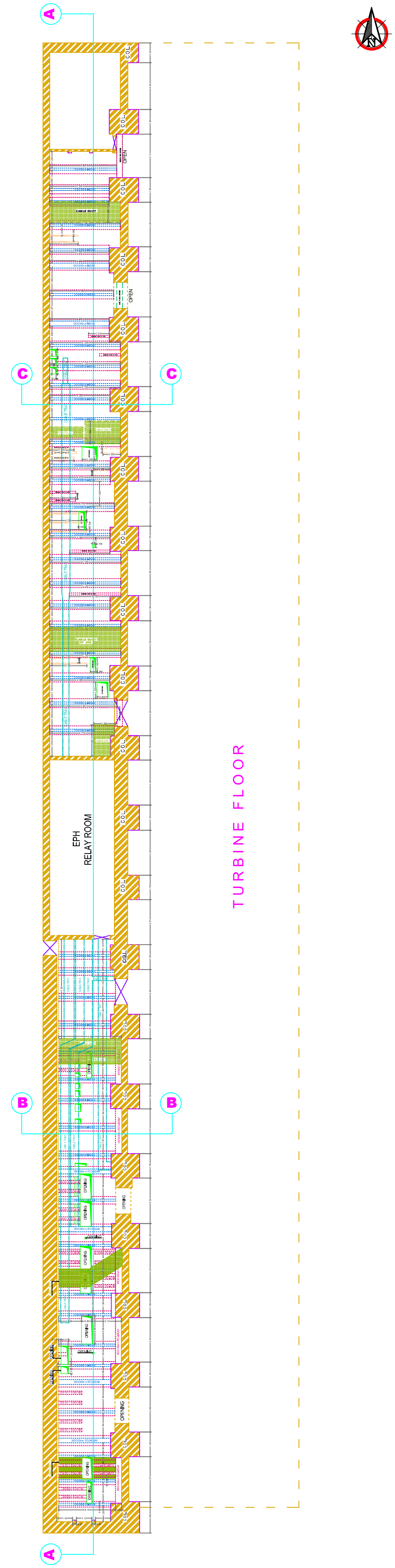
BPSU # 1 ROOM GROUND FLOOR SUPERIMPOSE ON 1ST FLOOR

SCALE {1:1000}

NOTE : ALL DIMENSIONS AND LEVELS ARE IN METERS.

THE TATA POWER CO LTD **BHIRA POWER HOUSE**		
BPSU # 1 ROOM GROUND FLOOR SUPERIMPOSE ON 1ST FLOOR		
M/s MUDIRAJ & BHUSHAN ENTERPRISES.		
SURVEYED & DRAWN BY	CHECKED BY	DATE : 07-06-2025
		SCALE : 1:1000
(MUDIRAJ.&BHUSHAN.)		DRG NO: R(01-12-25)
		MBE / 0000

COPY-3



OVERHEAD BEAM PLAN

1ST FLOOR EXCITATION TRF GALLERY SET # 1TO 3 & EXCITATION PANEL SET # 4, 5 & 6

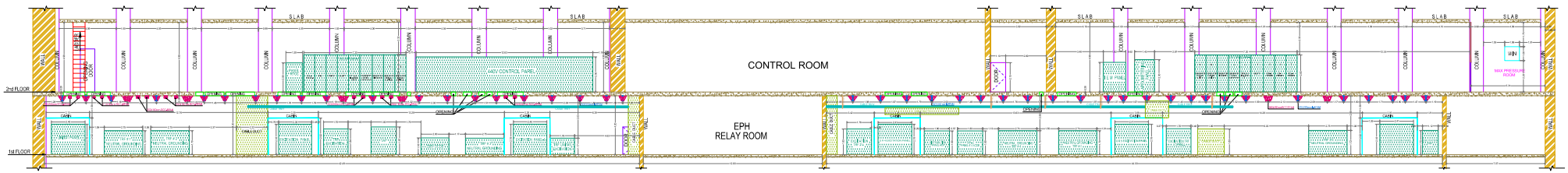
SCALE (1:1000)

LEGEND:-

	WALL
	OPENING
	DOOR
	WINDOW
	STAIRCASE
	PANEL
	BEAM
	COLUMN

NOTE : ALL DIMENSIONS AND LEVELS ARE IN METERS.

THE TATA POWER CO LTD BHIRA POWER HOUSE		
SURVEY PLAN OF 1ST FLOOR EXCITATION TRF GALLERY SET # 1 TO 3 & EXCITATION PANEL SET # 4, 5 & 6 AT BHIRA		
M/s MUDIRAJ & BHUSHAN ENTERPRISES.		
SURVEYED & DRAWN BY	CHECKED BY	DATE : 18-06-2025
		SCALE : 1:1000
		DRG NO: R0
(MUDIRAJ.&BHUSHAN.)		MBE / 0000



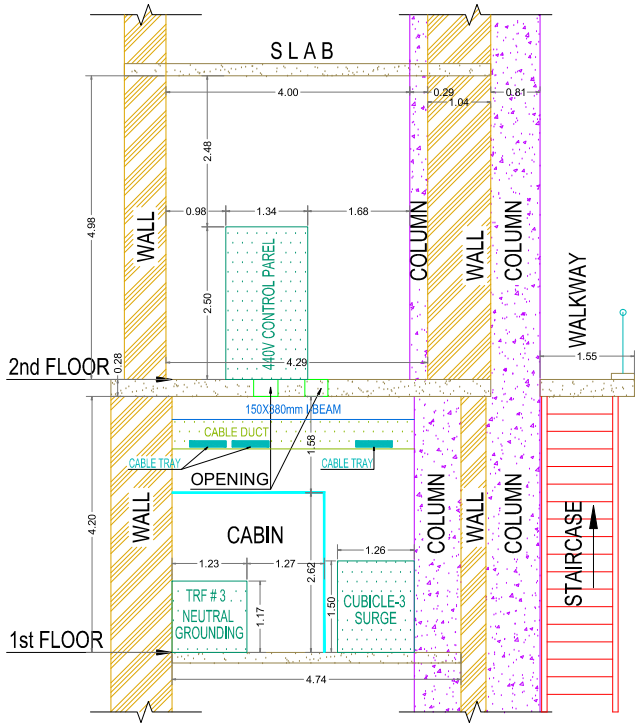
LEGEND

SECTION (A,A)

SCALE (1:1000)

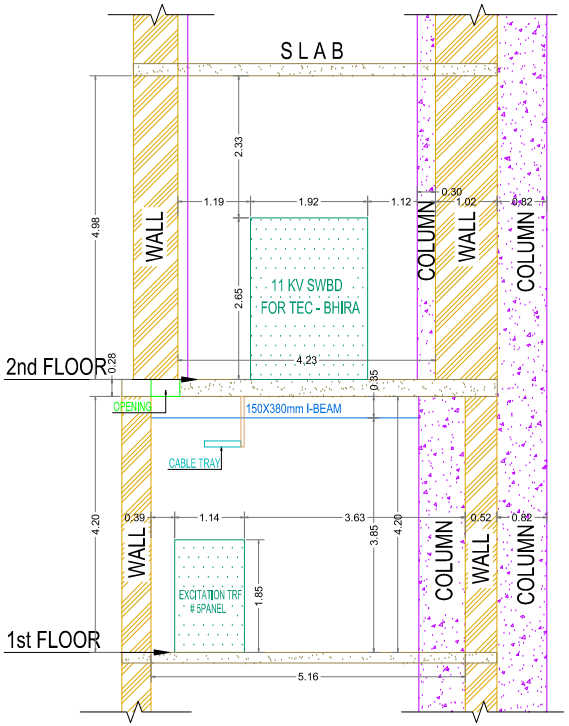
NOTE : ALL DIMENSIONS AND LEVELS ARE IN METERS.

THE TATA POWER CO LTD BHIRA POWER HOUSE	
DETAILED FIRST & SECOND FLOOR SECTION (A,A)	
M/s MUDRAJ & BHUSHAN ENTERPRISES.	
SURVEYED & DRAWN BY (MUDRA&BHUSHAN)	CHECKED BY
DATE : 19-04-2015 SCALE : 1:1000 DRG NO: 80 WBS : 0000	



SECTION (B,B)

SCALE {1:1000}



SECTION (C,C)

SCALE {1:1000}

LEGEND:-

WALL
OPENING
DOOR
WINDOW
STAIRCASE
PANEL
BEAM
COLUMN

NOTE : ALL DIMENSIONS AND LEVELS ARE IN METERS.

THE TATA POWER CO LTD BHIRA POWER HOUSE		
DETAILED FIRST & SECOND FLOOR SECTION (B,B)		
M/s MUDIRAJ & BHUSHAN ENTERPRISES.		
SURVEYED & DRAWN BY	CHECKED BY	DATE : 18-06-2025
		SCALE : 1:1000
(MUDIRAJ,&BHUSHAN,)		DRG NO: R0
		MBE / 0000

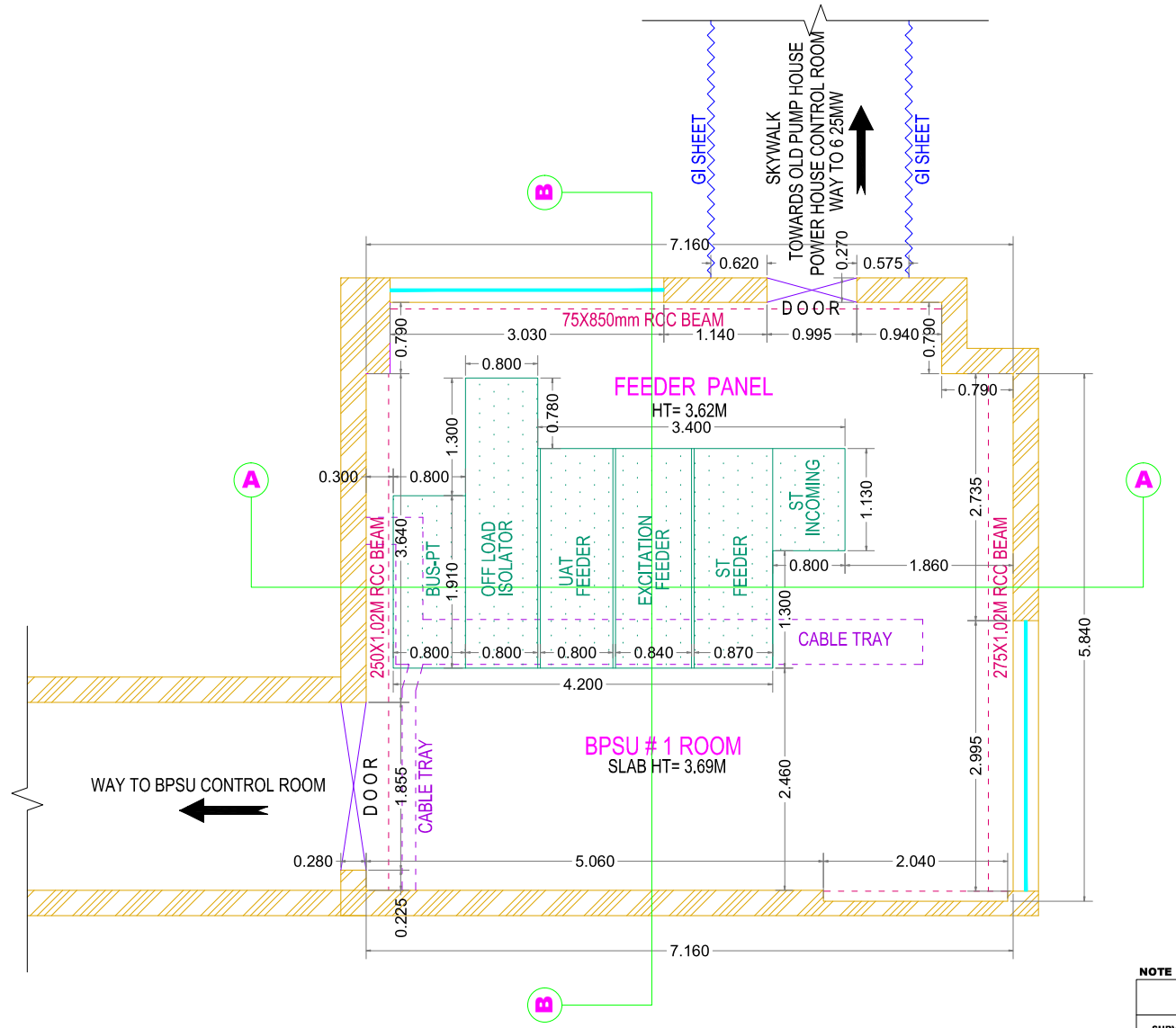
LEGEND:-

WALL
OPENING
DOOR
WINDOW
STAIRCASE
PANEL
BEAM
COLUMN

NOTE : ALL DIMENSIONS AND LEVELS ARE IN METERS.

THE TATA POWER CO LTD BHIRA POWER HOUSE		
DETAILED FIRST & SECOND FLOOR SECTION (C,C)		
M/s MUDIRAJ & BHUSHAN ENTERPRISES.		
SURVEYED & DRAWN BY	CHECKED BY	DATE : 18-06-2025
		SCALE : 1:1000
(MUDIRAJ,&BHUSHAN,)		DRG NO: R0
		MBE / 0000

COPY-2



SURVEY PLAN OF 1st FLOOR BPSU # 1 ROOM

SCALE {1:1000}

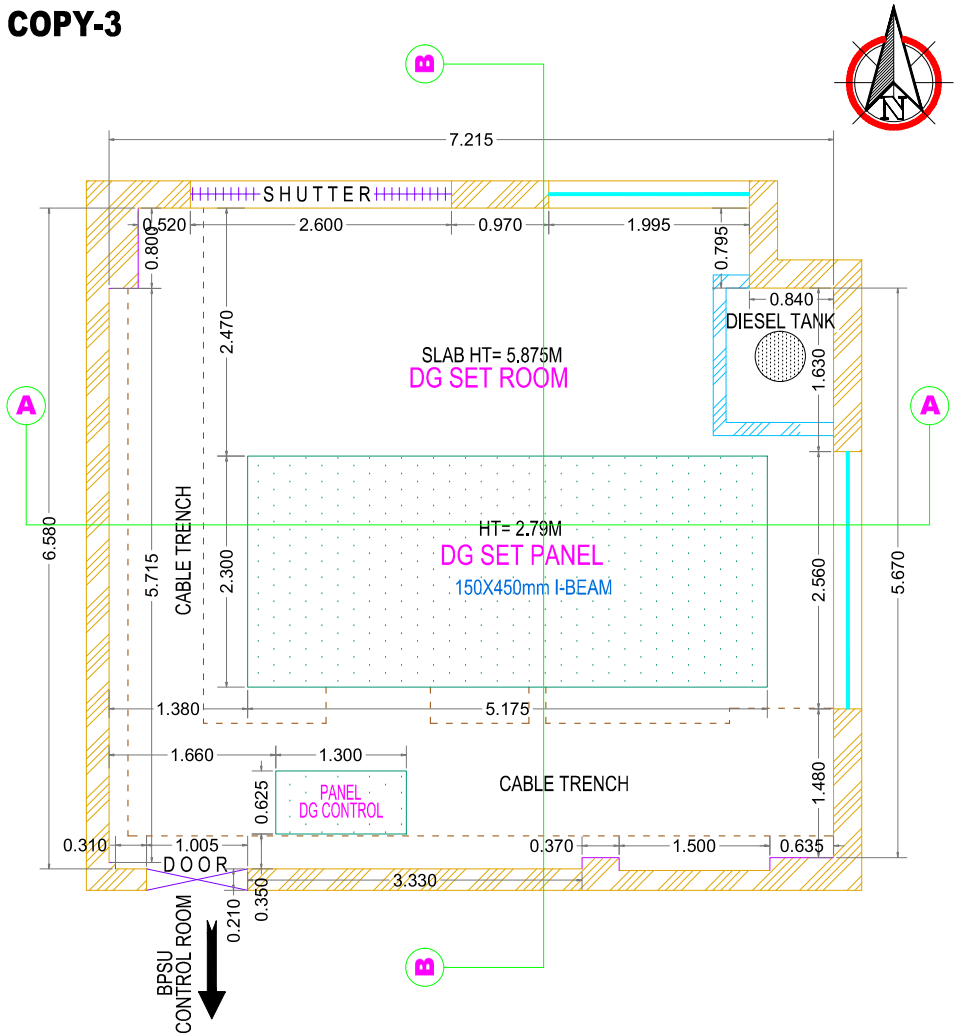
LEGEND:-

WALL
OPENING
DOOR
WINDOW
STAIRCASE
PANEL
BEAM
COLUMN

NOTE : ALL DIMENSIONS AND LEVELS ARE IN METERS.

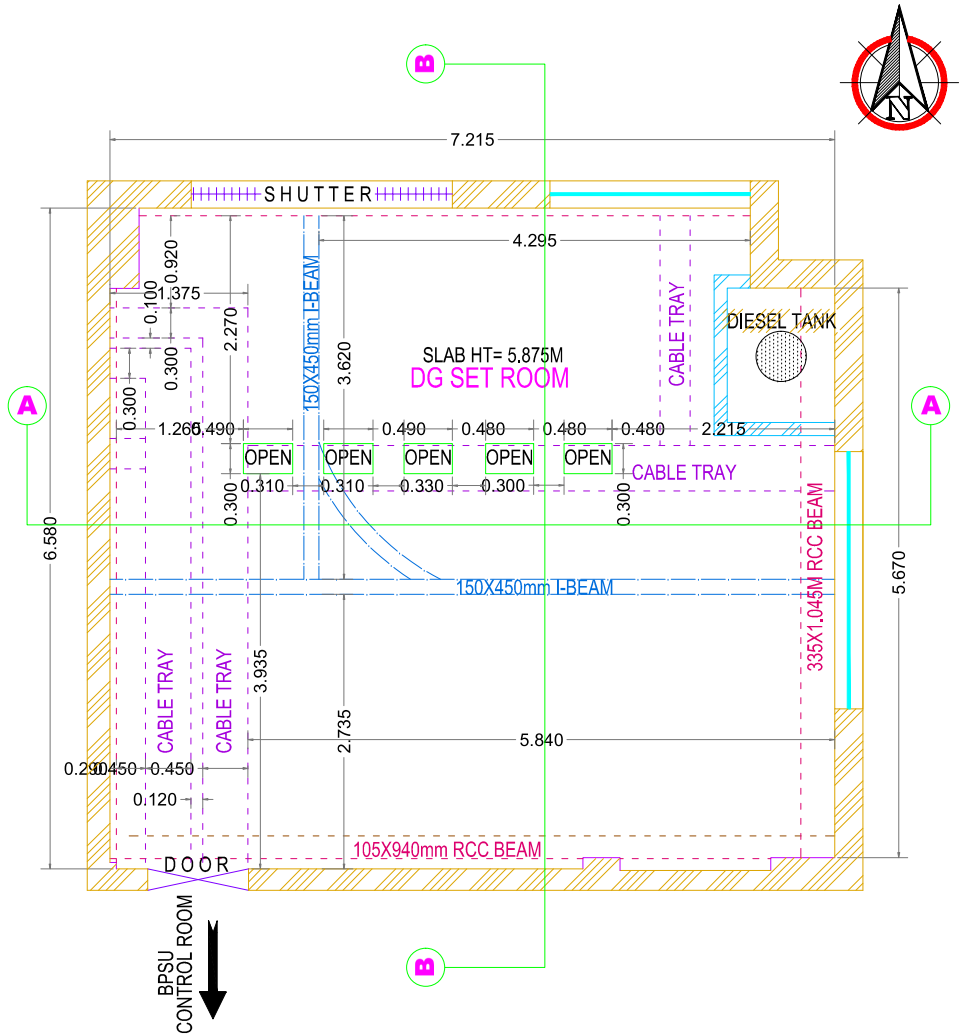
THE TATA POWER CO LTD **BHIRA POWER HOUSE**		
SURVEY PLAN OF 1st FLOOR BPSU # 1 ROOM AT BHIRA POWER HOUSE		
M/s MUDIRAJ & BHUSHAN ENTERPRISES.		
SURVEYED & DRAWN BY	CHECKED BY	DATE : 07-06-2025
		SCALE : 1:1000
(MUDIRAJ.&BHUSHAN.)		DRG NO: R(01-12-25)
		MBE / 0000

COPY-3



SURVEY PLAN OF GROUND FLOOR DG SET ROOM

SCALE {1:1000}



OVERHEAD PLAN OF GROUND FLOOR DG SET ROOM

SCALE {1:1000}

LEGEND:-

WALL
OPENING
DOOR
WINDOW
STAIRCASE
PANEL
BEAM
COLUMN

NOTE : ALL DIMENSIONS AND LEVELS ARE IN METERS.

THE TATA POWER CO LTD **BHIRA POWER HOUSE**		
SURVEY PLAN OF GROUND FLOOR DG SET ROOM AT BHIRA		
M/s MUDIRAJ & BHUSHAN ENTERPRISES.		
SURVEYED & DRAWN BY	CHECKED BY	DATE : 07-06-2025
		SCALE : 1:1000
(MUDIRAJ.&BHUSHAN.)		DRG NO: R(01-12-25)
		MBE / 0000

SECTION E

THE TATA POWER COMPANY LIMITED

STANDARD

TECHNICAL SPECIFICATION

FOR

GENERAL REQUIREMENTS OF

QUALITY ASSURANCE & INSPECTION

[SHALL BE A PART OF GENERAL TECHNICAL CONDITION]

(DOCUMENT NO - TPQAIT-QAXX-00-GN-QSP-214 R4)

Tata Power

Rev. No	Date	Description	Prepared By	Checked By	Approved By
R04	03/09/2021	Revision	DP/RP	SR/RS	CRB/CPT
R03	20/07/2020	Revision	SR	RP	CRB
R02	10/05/2017	Revision	DP /RP/RG/PU	SKJ/ RM/CRB	SS
R01	21/07/2016	Revision	SKJ / DP	RG	SS
R00	21/04/2015	First Issue	RG / SKJ / PU	SS	SS

TABLE OF CONTENTS

1.0 PURPOSE

Purpose of these requirements is to provide uniform general requirements for implementation of Quality Management System for projects being executed by OWNER.

2.0 SCOPE

2.1 Scope of these requirement covers pre-requisites of the Bidder's/ Supplier's/ Contractor's Quality Management System (QMS) applicable for all phases of contract execution including design, procurement, manufacture, factory testing, erection, field testing and commissioning, applicable other services and further to establish specific factors for which control shall be carried and put into continuing operation by the Bidder/ Supplier /Contractor to ensure that all supplies and services comply with the contract requirements.

2.2 The required/ specified reliability & other characteristics of quality should initially be "designed in" and then "built in". It is emphasized that, satisfactory product and system performance can be achieved only through strict control of all design, manufacturing and erection/ installation processes as well as test and inspection.

2.3 During bid stage itself, BIDDER shall submit requisite documents to demonstrate that as a supplier/ contractor they have well defined and implemented QMS. They shall also establish that their QMS is taking care of their sub-supplier/agencies, and continually improve its effectiveness in accordance with the requirements of their QMS as per ISO 9001, or any other quality standard.

BIDDER shall submit a project specific organization chart defining the permanent positions responsible for QMS accompanied by a brief description of each position's function and responsibility.

3.0 DEFINITION

- **OWNER**
  Tata Power or its subsidiaries/ JV partners.

- **BIDDER**
  An organization/ agency, who propose to submit their offer against RFQ/enquiry floated by OWNER. Only successful bidder will be converted to supplier/ contractor on award of contract by OWNER.

- **Supplier / Contractor**
  An organization referred as Supplier/ contractor, who execute the contract awarded by Contracts department of OWNER. It also covers the Agency involved in execution of site/ field activities or provides services (as a contractor) when awarded by Contracts department of OWNER. A Supplier can also be a manufacturer for part of supply for his in-house products.

- **Sub-Supplier/ Sub-vendor**
  An organization, who manufactures, supplies the system or equipment or item and provides services to the supplier. It also covers manufacturer who manufactures and supplies the equipment or its components or items to the sub-suppliers to complete the system supply. It

should also cover the agencies which also support execution of main supplier by providing qualified manpower/ services.

- **Third Party Inspection Agency (TPIA)**
  Any third-party organization or neutral agency mutually agreed, deputed for conducting inspection or quality surveillance activities on case to case basic.

- **Inspection Agency (IA)**
  An organization or any agency deputed by OWNER for conducting inspection or quality surveillance activities on behalf of OWNER on case to case basic.

- **Inspection Categorization Plan (ICP)**
  This document shall categorize the Quality Plan and Inspection scope of all equipment/ items in the package. This will also include the schedule for submission and approval of all Quality related documents.

- **Standard Quality Plan (SQP)/ Standard Field Quality Plan (SFP)**
  SQP shall comprise of minimum basic requirements of all tests/ checks to be carried out during manufacturing to meet/ conform technical requirement. SQP may be in the form of Inspection & Test Plan (ITP)/ Technical Specification as part of Bid Document.

  Similarly, SFP shall comprise of minimum basic requirements of all field tests/checks to be carried out during execution of the project.

- **Manufacturing Quality Plan (MQP)**
  MQP shall comprise of all tests/ checks indicated in standard Quality Plan (SQP) and tech specifications. It shall also include any additional quality checks/ tests required as per discussions (pre & post bid) to be followed during manufacturing of particular item/ equipment.

- **Field Quality Plan (FQP)**
  FQP shall detail out the activities and steps to be performed at project site and shall be followed from receipt of material to pre-commissioning stage. Shall include all tests / checks in Standard Field Quality Plan (SFP) & technical specification. FQP shall be prepared by contractor and to be submitted to OWNER at post award stage of contract for OWNER's approval.

- **Hold Point/ Customer hold point (CHP)**
  A check point for an activity mentioned in approved MQP/ FQP, which requires inspection/ verification, and acceptance by the OWNER or its representative for this stage before any further work is permitted.
  Supplier shall not process beyond a CHP without written acceptance & clearance of that activity by OWNER in writing.

- **Witness Point**
  A check point for an activity mentioned in the approved MQP/ FQP, which will be witnessed by OWNER or its representative.
  Supplier will obtain consent from OWNER to proceed for further work, in case OWNER or its representative is not able to attend the activity within notification period.

- **Review / Verification Point**
  A check point for an activity mentioned in the approved MQP/ FQP that requires review of document/ test record by OWNER or its representative performed by the Supplier for acceptance.

- **Test Report Record**
  Such reports / records are document prepared by Supplier/ Sub-Supplier for test/ check conducted indicating details / types of test including test results, relevant codes etc.

- **Inspection Report (IRT)**
  Such report which covers details of all the checks / activities carried out as per approved MQP. It also covers details of the observations and NCRs during those checks / inspection.

- **Inspection Release Note (IRN)**
  IRN is a document issued on standard format after successful quality checks/inspection and confirming to compliances of all observations and NCs if any.

- **Non-Conformity Report (NCR)/ Quality Correction Action Report (QCAR)**
  It is a report on deviation/ non-compliance with respect to the requirements laid down in the PO/ Technical Specification, MQP, Codes & standards. NCR shall be applicable during inspection at Shop as well during site Audits and QCAR shall be applicable for site inspection / surveillance.

4.0 QUALITY ASSURANCE PROGRAMME

To ensure that the equipment and services under the scope of contract whether manufactured or performed within the Bidder/ Supplier /Contractor's works or at his sub-vendor's premises or at site or at any other place of work are in accordance with the specifications, Bidder/ Supplier/ Contractor shall adopt suitable project specific QMS based on his organization's Quality Management System, regular practice, statutory requirements etc. as specified for the contract and submit the same for approval of OWNER, to control such activities at all points, as necessary. Such program shall be outlined by the Bidder/ Supplier/ contractor. Any deviation with respect to all above requirements (as specified in SQP, SFP, Technical specification as minimum quality requirements) shall be brought out clearly in the pre-bid stage by bidder.

4.1 OWNER Quality Document Approval Process & Inspection Process

OWNER uses Wrench software as an online platform for Engineering and Quality documents approval. Further, raising inspection call for STAGE / FINAL inspection for Category A items, Document review and material clearance for Cat B & Cat C items shall also be processed through Wrench. Access for Wrench system and necessary user training will be imparted to the authorized personnel of the supplier post award of contract.

5.0 SUPPLIER QUALITY MANAGEMENT SYSTEM (QMS)

5.1 All materials, components and equipment covered under the contract including bought out items shall be procured, manufactured and tested at all the stages as per a comprehensive Quality Assurance Program. It is the Bidder/ Supplier / Contractor's responsibility to draw up and implement such program duly approved by the OWNER.

5.2 All items/equipment in the scope of the contract shall be classified into categories according to the criticality or other attributes of items/ equipment. A detailed proposal addressing vendor approvals and quality control of all such items/ equipment shall be proposed to OWNER for approval.

5.3 The detailed quality plans for shop manufactured items and for field activities including civil works (if applicable) shall be drawn up by the Bidder/ Supplier / Contractor separately as per the requirement of the specification, standards mentioned therein, quality practices and procedures followed by Supplier's/ his sub vendor's quality control department. MQP shall be prepared by manufacturer and submitted through supplier post award stage of contract for OWNER's approval. OWNER approved MQP to be referred during manufacturing & shop inspection. Typical format of Manufacturing Quality Plan is enclosed as **Exhibit A**.

5.5 Field quality plans shall detail out for all equipment, the quality practices and procedures etc. to be followed by the execution agency, during various stages of site activities right from receipt of materials/ equipment at site to commissioning stage covering receipt, storage, erection & pre-commissioning tests. It shall comprise of all tests / checks indicated in SFP & Technical Specification including any additional quality checks / tests required as per discussions (pre & post bid). It shall also take care of minimum basic requirement of OEM/manufacturer (as the execution agency may not be part of OEM/manufacturer). OWNER approved FQP is to be referred during execution of work. FQP shall have 5 stages: Receipt, Storage, Pre-erection/ pre-fabrication, Erection/ Execution and pre commissioning checks with categorization of checks as Critical (Cr), Major (Mj) and Minor (Mn). Typical format of Field Quality Plan is enclosed as **Exhibit B**.

5.6 In these approved manufacturing and field quality plans, OWNER shall identify "Customer Hold Points" & "Witness Points". "Customer Hold Points" are test/checks which shall be carried out in presence of the OWNER's Engineer or its authorized representative and beyond which the work shall not proceed without consent of OWNER/ its authorized representative in writing. "Witness Points" are tests/checks which shall be carried out in presence of the OWNER's Engineer or its authorized representative but the work can proceed to next operation/ stage in case OWNER's Engineer doesn't attend on the mutually agreed date. The above procedure shall be applicable to the Bidder/ Supplier / Contractor's bought out equipment/ items also.

5.7 All the critical & major items shall be procured from the sub-vendors approved by OWNER. A tentative/ preferred list of sub-vendors for some of the items are indicated in Technical Specification. Based on which Bidder/Supplier/Contractor shall propose a list of sub vendors for bought out items for approval from OWNER. Detailed list of such sub-vendors offered by supplier/vendor/contractor shall be submitted not later than 7 days after the LOI/ Placement of order whichever is earlier and shall be frozen within 15 days of submission. Request for additional sub-vendors shall not be entertained from the Bidder/ Supplier / Contractor after the sub-vendor list is finalized and frozen. Only in case of Force Majure Condition, Supplier/ contractor shall establish such condition and propose new/ alternative source. Contractor / supplier shall provide requisite documents for consideration of OWNER. OWNER has right to accept/ reject based on review of details. If required, physical assessment shall be made before conveying such decision. Delays arising out of such exercises shall be entirely to the account of Supplier/ Contractor and shall not relieve him from any obligation, duty or

responsibility under the contract. For intended manufacturer/ sub-vendors/ sub-suppliers, credential / details to be submitted are as indicated below:

i. Company Profile.
ii. Name of the equipment proposed for approval with rating / capacity.
iii. Financial reports for the past 3 years.
iv. Organizational structure (including QA/QC set-up, man-power & qualification details).
v. In-house design capability, R&D facility & Technical collaborations (if any).
vi. In house manufacturing facilities (Including process flow charts).
vii. In house Testing facilities.
viii. Type Test Reports (as applicable).
ix. List of sub-suppliers for critical/major Raw material & bought out items.
x. In-coming material inspection plan and manufacturing quality plan.
xi. Certification by reputed agencies (ISO/ NABL/ NSIC/ ASME/ CE/ UL/API etc.) & government agencies (Factory licenses).
xii. Product approval certificates from other customers and regulatory Authority etc.
xiii. In case of non- ISO Company, details of quality system followed.
xiv. Experience (Past track records) for last 3 yrs. for similar product from the facility.
xv. Performance certificates issued by other customers.
xvi. Customer / Supplier complaints handling and resolution records
xvii. After Sales / Services details
xviii. Details of out-sourced activities, if any.

5.8 **Non-Conformance Report (NCR) / Quality Correction Action Report (QCAR)**
Wherever the non-conformity is found during inspection either by Supplier or OWNER or its representatives, NCR / QCAR shall be issued in prescribed format. Manufacturer /Supplier shall indicate the Correction / CAPA and submit these NCRs/QCARs to OWNER or its representative for their review & resolution. Till such time identified item/ equipment will be kept under quarantine. Upon satisfactory completion of the rectification work, final acceptance of the item/equipment shall be documented on the NCR/QCAR format.
Supplier has to close all NCR / QCAR in systematic & time bound manner including all corrective and preventive actions. Job shall progress only after effective resolution of NCR / QCAR.

Note: If OWNER observes that any material or equipment is unacceptable with respect to potential safety, reliability, interchangeability or workmanship, OWNER shall issue a non-conformance report NCR / QCAR in this regard to the Supplier/ Contractor. Such NCR/QCAR shall be dealt as above.

5.9 No material shall be dispatched from the Bidder's/ Supplier's/ Contractor's /manufacturer's works before the dispatch instruction is given in writing by the OWNER, Subsequent to pre-dispatch inspection including verification of records of all previous tests/ inspections by OWNER/ authorized representative. Any such item/material dispatched by party without clearance from OWNER shall be at suppliers' risk & cost only. No IRN/ dispatch clearance shall be issued for the same as post facto.

5.10 OWNER or its nominated representative reserves the right to carry out quality audit/ quality surveillance of the systems and procedures of the Bidder/ Supplier/ Contractor's or their sub-vendor's Quality Management System and control activities without prior intimation. The Bidder/ Supplier/ Contractor shall provide all necessary assistance to OWNER or its nominated representative to carry out such audit/ surveillance.

5.11 The Bidder/ Supplier/ Contractor shall be responsible for providing, controlling, calibrating, and maintaining the 'measuring & test equipment' required by them for demonstrating compliance of supplies within contract requirements at shop and at site. All the measuring instruments shall be calibrated at periodic intervals determined by Bidder/ Supplier/ Contractor/ sub-vendor on the basis of his suitability, purpose and usage as per the system adopted by him for calibration of such measuring and test equipment. However, in no case, shall the interval between successive calibrations be more than 12 months. All measuring and test instruments shall have valid calibration certificates and calibration data shall be made available to OWNER or its nominated representative on demand.

5.12 Quality surveillance/ approval of the results of the tests and inspection shall not, however, prejudice the right of the OWNER to reject the equipment if it does not comply with the specification when erected or does not give complete satisfaction in service and the above shall in no way limit the liabilities and responsibilities of the Bidder/ Supplier / Contractor in ensuring complete conformance of the materials/ equipment supplied to relevant specification, standard, data sheets, drawings etc.

5.13 For all spares and replacement items, the quality requirements as agreed for the main equipment supply shall be applicable. Inspection of all mandatory spares and commissioning spares shall be in line with the approved MQP of respective equipment/item. Interchangeability Certificate shall also be part of quality records for all spares.

5.14 **Statutory Inspection**

Supplier to ensure that Equipment/ items which fall under statutory requirements of country where the equipment will be installed, shall be inspected by statutory authority like IBR etc. In case of imported items, statutory inspection will be carried out by the agency as nominated by Statutory Authority or Statutory authority of the country of origin. Original certificates endorsed by statutory authorities shall be submitted to Project Manager as identified in the contract.

Such items shall also be offered to OWNER for inspection irrespective of country of origin.

5.15 **Failure to Pass Tests**

If any item/ equipment fails to pass any test, the Bidder/ Supplier shall rectify or replace the same and, unless OWNER agrees to dispense with repetition of the test, shall repeat the test following a further notice. The cost and expense of any such retest shall be fully borne by the Bidder/ Supplier only.

5.16 Major repair/rectification procedures to be adopted to make the job acceptable shall be subject to the approval of the OWNER/ its authorized representative.

5.17 All tests shall be carried out to the satisfaction of the OWNER/ its authorized representative either in their presence or as agreed by OWNER. All reports/ protocols, site and shop inspection reports shall be developed specific to the requirements of the project which is acceptable to OWNER. The same shall be applicable to erection testing and pre-commissioning reports and protocols also.

Only tested, inspected and accepted (by OWNER) material as listed in PO / ICP shall be dispatched to project site. Any diversion of such accepted material without any prior approval shall be considered as deviation/ breach of contract and a minimum penalty of 5 times the cost of inspection will be levied.

5.18 Approval of any concession shall be the prerogative of the OWNER and approval of concession for a particular case shall not be set as a precedent.

5.19 All the equipment shall be of proven design and type tested. Valid type test reports shall be furnished to engineering for review and acceptance prior to offering equipment for inspection.

5.20 All documents/ reports/ records shall be issued either in English language or bilingual with English.

6.0 INSPECTION CATEGORIZATION PLAN, WELDING & NDT REQUIREMENT

6.1 **Inspection Categorization Plan (ICP)**

This document shall be prepared by supplier and to be submitted to OWNER for approval in attached standard format for all package items within 15 days of award of contract.
The schedule shall be prepared considering that all MQP should be approved at-least 15 days prior to start of any manufacturing activity and FQP with related procedures shall be finalized at least 15 days prior to dispatch schedule/ site mobilization.

ICP, MQP, FQP and related procedures shall form part of Master Drawing List (MDL)

All the items/equipment in the scope of the contract shall be classified into categories (A/ B/ C) according to the criticality or other attributes of items / equipment. A detailed proposal addressing vendor approvals and quality control of all such items /equipment shall be proposed to OWNER by the Supplier/ Contractor for approval.

Category "A": Manufacturing Quality Plan (MQP) shall be approved by Tata Power.
Stage &/ or Final Inspection including document review by EPC Contractor and Tata Power (or its appointed Inspection Agency) as per approved MQP.

Category "B": Manufacturing Quality Plan (MQP) shall be approved by Tata Power
Stage &/ or Final Inspection including document review by EPC contractor or Tata Power (in case no EPC Contractor) as per approved MQP. Inspection report of EPC contractor/ Supplier with supporting documents review by Tata Power.

Category "C": Supplier shall carry out inspection as per their regular practice/ standard manufacturing quality plan. Supplier shall submit test report and COC (Certificate Of Conformance) to EPC Contractor/ Tata Power for approval/acceptance. COC shall be in standard format of Tata Power.

6.2 **Welding & Non-Destructive Testing** (applicable for shop as well project site)

6.2.1 Bidder / Supplier/ Contractor shall submit the following documents in requisite copies for review and approval of OWNER/ its authorized representative at least FOUR weeks prior to commencing fabrication/ manufacturing and finalize before start of job. All such submissions shall be made in ENGLISH language only.

i. Welding procedures together with the relevant procedure qualification records.
ii. Non-destructive testing procedures.
iii. Heat treatment procedures.

iv. Any other special procedure (as applicable) proposed to be used during project execution Welding procedures and welders' qualifications in accordance with the latest revision of ASME Boiler & Pressure Vessels Code, Section IX, (structural welding as per AWS D1.1) or equivalent standard covering all essential & non- essential variables shall be acceptable to OWNER.

6.2.2 Only qualified welders shall be deployed. Welders shall be qualified as per approved WPS in presence of OWNER/ its authorized representative. Electrode/ welding rod used at project site shall be of OWNER approved make. Supplier/ Contractor shall take prior approval.

6.2.3 Weld repair procedures are subject to approval of the OWNER. No welding is permitted on C.I. Castings. OWNER reserves the right to examine and witness acceptance tests, prior to and following weld repairs and subsequent post weld heat treatment, mechanical tests etc, at the material manufacturer/ Supplier works.

6.2.4 Should any of these welds prove to be defective on inspection, the number of welds to be tested in that system shall be twice that of originally selected. Should any of the second incremental welds prove to be defective, then 100 % of the welds in that system/ group shall be tested.

6.2.5 NDT operators shall be qualified in accordance with an agreed nationally accredited scheme such as the Personnel Certification in Non-destructive testing (PCN) scheme and shall be certified to level II or higher of that system.

6.2.6 Plate thickness ≥ 32mm (for structure), Plate thickness ≥ 25mm (for pressure vessel), Forging / Bar dia. ≥40mm (finished) shall be UT tested (Ultrasonic).

7.0 INSPECTION AT SHOP

7.1 Inspection Scope

The scope of inspection shall be as per Witness/ Hold Point as defined in approved MQP/ SQP. Supplier has to ensure that all applicable and agreed approved Drawings, Data Sheet etc. are available for any inspection and equipment used for measurement are calibrated. Supplier shall intimate all such cases in advance (as inspection rolling plan) and also through inspection call as per contract agreement.

7.2 Inspection Coordination

Supplier has to identify single point of contact for coordination of the entire inspection activities on behalf of Supplier/ sub-supplier. Supplier to ensure that monthly and 3 monthly rolling inspection plans are prepared and submitted in advance to OWNER by 1st working day of each month for effective inspection coordination.

7.3 Inspection Request

7.3.1 Depending upon the stages of inspection as agreed in manufacturing quality plan, supplier to send Inspection Request through Wrench system with approved inspection reference documents to OWNER Project Manager for inspection activities to be attended at supplier's /sub-supplier's premises. Supplier to confirm the possibility for conducting remote inspection through Video calling system (preferably MS Teams), if required. Further, supplier to discuss & confirm the readiness of material by submitting internal test reports of the item/ equipment offered for inspection, job readiness pictures and testing schedule

through email. Supplier has to give sufficient advance notice, as defined below for inspection of any stage. Contractor/Supplier to strictly adhere to notice period indicated below and the testing schedule shared. Any additional expenses incurred due to the improper planning at supplier end for travel/ accommodation shall be in Supplier / Contractors scope.

7.3.2 The minimum advance notice period for inspection shall be given below:

i. Inspection within INDIA : 7 Days

ii. Overseas (Outside India) Inspection : 30 Days

Supplier to strictly adhere the above mentioned minimum advance notice period.

7.3.3 Supplier shall plan the inspection visits required in a manner so as to achieve maximum inspection stages attended with minimum possible inspection visits/ time where-in more than one external inspection agencies are involved for single inspection activity, inspection by all agencies may be done concurrently.

7.4 **Inspection Methodology**

7.4.1 Suppliers shall ensure internal inspection before offering inspection to OWNER or its representative. Internal test certificates and previous stage inspection reports submitted for review and made available during inspection.

7.4.2 During inspection, Supplier to produce copies of the latest revision of the approved MQP along with drawings, Data Sheet, Standard and accepted type test reports as indicated in approved MQP / agreement to ensure that the inspection is carried out as per the latest revision and approved documents. **If required, supplier to arrange the necessary codes and standards for reference purposes.**

In case inspection cannot be completed or undertaken due to reasons such as non-readiness of material, back up documents, false inspection calls etc. then such reason shall be recorded in inspection report. **If supplier fails to offer the item / equipment for inspection as per the agreed date, supplier liable to pay for the time and expenses for the abortive visit of the OWNER or its representative.**

7.4.3 All inspection related documents i.e. mill test reports, supplier inspection/ tests reports, all inspection/ tests carried out including other records such as stress relieving charts, radiographic reports and other non-destructive testing records in accordance with provision of contract shall be submitted in original form. All such reports shall be duly endorsed/ certified by the main supplier.

7.4.4 Results of tests and copies of inspection report, test reports, original material test certificates (MTCs), calculations, performance curves etc. shall be promptly made available to the OWNER or its appointed representative by the Supplier, in accordance with this document and shall form part of the subsequent Manufacturers Test Record Book in accordance with the requirements of this document.

7.4.5 Supplier to ensure that all the materials are properly identified/ coded to confirm traceability and correlation purposes.

7.4.6 Supplier shall take special care including packing to protect the final painting and finish product (equipment / item) during handling, transportation, storage and execution stage so

that there is no damage occur. In case of any such damage, joint inspection to be carried out at site and necessary action to be taken.

7.4.7 Supplier to ensure finish product is properly identified after completion of inspection and are suitably recorded in Inspection Report by inspection engineer.

7.4.8 Corrosion testing as per ASTM A262 Practice E for Austenitic Stainless Steel and ASTM A923 Practice A and C for Duplex Stainless Steel components has to be carried out.

7.4.9 For rubber lining application, following checks shall be carried out on raw material for rubber – Grade identification, Tensile Strength, Elongation, Maximum Compression test, Ageing Test, Water Absorption test, Specific Gravity, Hardness, Ash Content, Bleed resistance, Ozone resistance test.

7.5 **Inspection Report & Clearance**

7.5.1 **Inspection Report (IRT)**

All inspection by OWNER or its appointed agency shall be supported by an inspection report as per the standard format (sample enclosed). Any shortcoming observed w.r.t. approved MQP/ Drawing/ Data Sheet / specification etc. shall be recorded as NCR. IRT shall have detail references of all such NCRs. All such inspection report / NCR shall be jointly signed by supplier and Inspection Engineer. IRT shall be issued to all concern including Supplier and Sub-supplier/ Manufacturer. Same will be uploaded in Wrench system by OWNER

7.5.2 **Inspection Release Note (IRN)**

IRN shall be issued through Wrench system by QA&I dept. to Project Manager of OWNER, only after satisfactory compliance for Inspection remarks.

IRN for Category 'A' item (as defined in ICP) shall be issued only after ensuring inspected Equipment / Item meets the requirements of the applicable documents and all NCs have been closed to the satisfaction of OWNER.

For Category 'B' items (as defined in ICP) IRN shall be issued through Wrench after review of supplier inspection report, compliance report and required applicable documents as per approved MQP & Closure of NCs if any are verified and accepted to the satisfaction of OWNER

For Category 'C' items (as defined in ICP), IRN shall be issued through Wrench after review of original manufacturer test certificates, Certificate of Conformance (CoC) from supplier/contractor in OWNER standard format and required applicable documents as per MQP approved by main supplier / as per their standard procedure are verified and accepted

7.6 **Material Dispatch Clearance Certificate (MDCC)**

Supplier shall obtain dispatch clearance certificate (MDCC) through Wrench from project / Plant Manager depending on the project progress and material requirement at site based on IRN prior to dispatch of any billable material/ equipment / item from Manufacturer place to OWNER Project Site / Plant. One set of Quality Dossier (hard copy) for which MDCC has been issued, shall be sent to project site along with material / equipment/ item.

MDCC is not required for material / equipment/ item/ Part supply which are dispatched from one sub-supplier works to another sub-supplier/ supplier works for further assembly and

testing (to make it billable). However, clearance in the form of Inspection Report (IRT) is needed in this regard.

8.0 QUALITY DOSSIER (FOR SUPPLY PORTION) [Package wise]

Supplier shall compile and submit all stage and final inspection reports as per approved MQP, duly reviewed and endorsed by inspection engineer for reference and records of OWNER. Documents shall be submitted with-in 4 weeks of issuance of final MDCC

Dossier shall consist of following documents, as minimum:

i. Index Sheet
ii. Approved bill of material of package.
iii. All Approved documents (MQP, Drawings & Data Sheet etc.)
iv. MDCC, IRN & IRT along with all closed NCR of all items.
v. Factory Acceptance Test (FAT) reports.
vi. Raw material and bought out item MTC's
vii. Test Reports corresponding to IRT & MQP.
viii. Supplier internal inspection reports as per MQP.
ix. Copy of Statutory and IBR certificates as applicable.

Note:

1. Each package compilation shall be done on the basis of unit wise and common systems.
2. Each volume/ dossier shall be spiral/ hard bounded. Each sheet of dossier to have running numbers.
3. One hard copy (in addition to the dossier dispatch with material / equipment/ item) and 2 Soft copies of documents to be submitted as final dossier (shall also be uploaded in Wrench System for future reference.

9.0 FQC DURING CONSTRUCTION AND PRE-COMMISSIONING.

9.1 Supplier Quality Management System is applicable for field activities also and for his further sub agencies deputed at project / plant. Refer clause no: 5.0 (applicable part). Supplier/ Contractor shall deploy sufficient number of QA/ QC persons to take care of daily activities as per agreed/ approved Quality documents. Some of such activities are detailed below. Also, supplier Project Manager shall regularly co-ordinate with OWNERs FQC team.

9.2 Raising of inspection calls on regular basis for various activities as indicated in approved FQP/ other document, carrying out inspection activities along with OWNER's execution / FQC department and maintaining the records duly signed by all concerned.

9.3 Various inspection/ quality assurance procedures/ methods at different stages of erection and pre-commissioning will be as per OWNERs approved field quality plans/ codes/ IBR and other statutory provisions and as per OWNER's engineer's instructions.

9.4 Preparation of quality assurance log sheets and protocols, welding logs, NDE and post weld heat treatment records, testing & calibration records and other quality assurance documentation as per OWNER's engineer's instructions is within the scope of work/ specification. These records shall be submitted to OWNER for approval from time to time.

9.5 A daily logbook of all measurements and testing/ calibration should be maintained by contractor on the job inspection details for various equipment. Contractor to depute competent engineer for site testing and pre-commissioning of equipment's' (as applicable).

9.6 All the workers of contractor / sub contractor/it's agencies shall carry identity cards as per the Performa prescribed by OWNER. Only workers duly authorized by OWNER shall be engaged on the work.

9.7 Contractor shall provide all the measuring and monitoring devices (MMD) required for completion of the work satisfactorily. These MMDs shall be calibrated & conform to job requirement in respect of measurement range, accuracy level & any other specification**.**

9.8 Re-work necessitated on account of use of invalid MMD shall be entirely to the contractor's account. Contractor shall be responsible to take all corrective actions, including resource augmentation if any, as specified by OWNER to make-up for the loss of time.

OWNER's FQC team / QAI representative will have the right to carry out Surveillance and Audit of supplier/contractor and their agencies including their store without any prior intimation.

9.9 Regular Internal audit shall be conducted by supplier/ contractor QA/QC team of their agencies and their other dept. Such audit reports shall be made available whenever ask for by OWNER FQC team. OWNER FQC/ QA&I have the right to carryout 2nd party audit of supplier/ contractor and their agencies as per predefined Audit schedule.

In course of work OWNER may counter/ finally check the measurements with their own MMDs. Contractor shall render all assistance in conduct of such counter check/ final measurements.

9.10 **Communication**

Direct, formal communication between the SUPPLIER's field QC and OWNER's field QC representative is mandatory. All inspection activities as per field quality plan shall be intimated to OWNER in the form of Request for Inspection (RFI) at least 24 hrs. in advance with intimation to OWNER execution group.

Whenever any major issues / deviations related to design or fabrications are noticed, the same shall be immediately informed to OWNER's field QC by supplier's field QC/ Supplier Project Head. On completion of above activity, joint inspection reports/ protocol shall be made and circulated to concern agencies. Any part of work at the site shall not be **covered up or made inaccessible** without the OWNER Representative's prior approval in the form of joint protocol or otherwise.

Contractor to prepare acceptance test records as indicated in field quality plan for all Minor/ Major / Critical checks or activities, such as site register for all storage and receipt of materials, erection protocol for pre-rection and erection activities, testing and commissioning records for all testing, commissioning and charging activity as indicated in the FQP for a particular equipment or system and approved by OWNER. All the critical checks mentioned in the field quality plan to be documented strictly and to be approved by OWNER. All the FQP related Documents shall be uploaded in Wrench, as part of handing over dossier.

Further, SUPPLIER/ Contractor's in-progress inspection reports, logbook, follow up/ punch out sheets; records of all DT & NDT etc. shall be made available to OWNER field QC during entire course of the work. At the end of the work, SUPPLIER/ Contractor's standard inspection reports, check off sheets, radiographs, master copy of loop diagrams, electrical testing data sheets, etc. shall be handed over to OWNER in an organized and agreed format. SUPPLIER/ Contractor shall verify that all of the required documentation of the equipment has been received and placed in the equipment files. The SUPPLIER/ Contractor is responsible for obtaining any outstanding documentation from his sub-supplier/ agencies.

9.11 **Dealing with Open Punch Points (NCR/QCAR):**

All open points in the form of observations, non-conformities (NCR, QCAR etc.) that are not responded / closed in time as well as, those were not put up by supplier/ Contractor for resolution/ agreement to OWNER, the same will be considered as violation of contractual obligations and will be dealt suitably during closure of contract. Penalty clauses (if any) shall be applicable as per contract.

Supplier/ Contractor's Performance rating will be impacted as per prevailing policy of OWNER in this regard.

10.0 ATTACHMENT

1. Exhibit A – MQP Format
2. Exhibit B – FQP Format
3. Exhibit C – Shop Inspection Request Format
4. Exhibit D – ICP Format
5. Exhibit E – IRN Format
6. Exhibit F – Suggested MDCC Format
7. Exhibit G – RFI Format (For Site Inspection Request)
8. Exhibit H – NCR Format
9. Exhibit I – QCAR Format
10. Exhibit J – Weekly Progress Report format

Supplier Logo Supplier Document No	THE TATA POWER COMPANY LIMITED PROJECT NAME **Supplier Name & Address**	TATA POWER Document No Page 1 of 1

Document Title: MANUFACTURING QUALITY PLAN (MQP)

Document No:

Consultant:

EPC Contractor:

Manufacturer Name & Address:

R1					
R0					
Revision	Date	Reason for Revision	Prepared By	Checked By	Approved By

Supplier Logo Supplier Document No	**Manufacturing Quality Plan for ……**	Document No. *(As given by PDM, Tata Power)* Date & Revision
	Manufacturer Name & Address	
	PACKAGE NAME	Page .. of .....

SR. NO.	COMPONENT Description / Activity	CHARACTERISTICS	TYPE OF CHECK	EXTENT OF CHECK	REF. DOCUMENT / ACCEPTANCE NORM	FORMAT OF RECORD	AGENCY			REMARKS
							M	S/C	O	
1	2	3	4	5	6	7	8			9
1.0	MATERIAL:						P	R	R	
2.0	IN-PROCESS INSPECTION:									
3.0	FINAL INSPECTION:									
4.0	ISSUANCE OF IRN (BY REVIEWING OF QUALITY DOSSIER)									

NOTE

a). Statutory requirements will be complied by the contractor/ Supplier.
b). Material samples drawn for check testing will be witnessed by TATA POWER or its representative.
c). For stage inspections, copies of relevant documents will be furnished to TATA POWER for review.
d). The extent of check for manufacturer shall be 100%.
e). Column 6 will be as per TATA POWER approved drawings / data sheets / contact documents wherever applicable.
f). All instruments shall have valid calibration certificate with traceability to national level

Legends: M – Manufacturer, S – Supplier C – EPC Contractor, O – Owner (Tata Power), P – Perform, W – Witness, R – Documents Review, H – Hold point, Rw (%) – Random Witness

EPC Logo EPC Document No	THE TATA POWER COMPANY LIMITED PROJECT NAME Contractor's Name & Address	TATA POWER Document No Page 1 of 1

Document Title: FIELD QUALITY PLAN (FQP)

Document No:

Consultant:

EPC Contractor:

R1					
R0					
Revision	Date	Reason for Revision	Prepared By	Checked By	Approved By

TATA POWER	The Tata Power Company Limited Engineering (Generation)	TATA
Doc. No.:	STANDARD FQP FOR	Date of Issue:

Sr. No	COMPONENT / OPERATION	CHARACTERISTICS CHECKED	CLASS OF CHECK	TYPE OF CHECK	EXTENT / FREQUENCY OF CHECK	REFERENCE DOCUMENTS / ACCEPTANCE NORM	FORMAT OF RECORD	REMARKS
1	2	3	4	5	6	7	8	9

NOTE

A) STATUTORY REQUIREMENTS WILL BE COMPLIED WITH BY THE CONTRACTOR.
B) FOR STAGES WITNESSED / DOCUMENTS REVIEWED BY TATA POWER, COPIES OF RELEVANT DOCUMENTS WILL BE FURNISHED TO TATA POWER.
C). TATA POWER / ITS REP. IDENTIFICATION STAMP ON MATERIALS WILL BE PRESERVED / GOT TRANSFERRED BY TATA POWER / IT'S REP AT APPROPRIATE STAGES.(IF REQUIRED).
D). THE EXTENT INDICATED IN COLUMN 6 IS IN CONTRACTOR'S SCOPE.TATA POWER MAY INSPECT AS PER THIS COLUMN OR RANDOM SAMPLES AT IT'S DESCRETION.
E). COLUMN 7 WILL BE AS PER TATA POWER APPROVED DRAWINGS / DATA SHEETS / CONTRACT DOCUMENTS WHEREVER APPLICABLE.
F). INSTRUMENTS FOR LEAK TESTS AND PERFORMANCE TESTS WILL HAVE VALID CALIBRATION CERTIFICATE WITH TRACEABILITY TO NATIONAL LEVEL.

Critical Category is HOLD point.	This activity required inspection / Verification & acceptance by inspection authority responsible for this stage before further processing is permitted., 24 Hrs advance notice to be given to TATA POWER FQC. Contractor /sub contractor shall not process activity beyond HOLD point without written permission by TATA POWER FQC. This activity shall be performed by Main & Sub- Contractor (Execution + FQC) & witnessed jointly by TATA POWER (Execution + FQC). (Surveillance by Head FQC / Project Head).
Major Category is Witness point.	This activity required inspection / Verification & acceptance by inspection authority responsible for this stage before further processing. 24 Hrs advance notice to be given to TATA POWER (Execution) . Contractor /sub contractor shall not process activity beyond Witness point without written permission by TATA POWER (Execution). This activity shall be performed by Main and Sub- Contractor (Execution + FQC) & witnessed by TATA POWER Execution & Surveillance by FQC.
Minor Category is Review point.	This activity required review of documents by TATA POWER for the compliance & acceptance, However 24 Hrs advance intimation to be given to TATA power (Execution). This activity shall be performed by Main and Sub- Contractor (Execution +FQC) . (Surveillance by Execution / Project Head).
	TATA POWER reserves the right to carryout surveillance at any point of time through FQC.

TATA POWER	The Tata Power Company Limited Engineering (Generation)	TATA
Doc. No.:	STANDARD FQP FOR	Date of Issue:

Sr. No	COMPONENT / OPERATION	CHARACTERISTICS CHECKED	CLASS OF CHECK	TYPE OF CHECK	EXTENT / FREQUENCY OF CHECK	REFERENCE DOCUMENTS / ACCEPTANCE NORM	FORMAT OF RECORD	REMARKS
1	2	3	4	5	6	7	8	9

STORAGE TYPE:

TYPE-1: OPEN AREA & ABOVE GROUND ON WOODEN PLANK WITH SLOPE FOR WATER DISPOSITION.
TYPE-2: OPEN AREA & ABOVE GROUND ON WOODEN PLANK (WITH SLOPE FOR WATER DISPOSITION) AND COVERED WITH TARPAULIN.
TYPE-3: OPEN SHED WITH FULLY FORMED FLOORING/CEMENT FLOORING.
TYPE-4: COVERED SHED/STORE ROOM ON RACKS & IDENTIFIED LOCATION.
TYPE-4A: CLOSED CHAMBER WITH TEMPERATURE & HUMIDITY CONTROL.
NOTE: Items/equipments having shelf life like paints, alumina, desiccant etc. are to be stored seperately for identification purpose.

Rev. No	Reason for Revision	Prepared By & Date	Checked By & Date	Approved By & Date	Issued By.
R0	ISSUE FOR USE				

Exhibit - C

Request No:
Date:

TATA
TATA POWER

Engineering (Generation)

Shop Inspection Request Format

Project Name:	
Main Supplier	
Package Name:	
Tata Power P. O. / LOI No. Date	
Item / Equipment offered for inspection:	
Inspection Category:	**A / B / C**
Sub-supplier (Manufacturer) name & PO Number:	
Type of Inspection: (Please mention the stage number of MQP which will be completed during this inspection)	**Stage / Final**
Proposed Date of Inspection:	
Place of Inspection: (Please give complete address where material will be inspected, attach route map if required)	
Contact Person for this Inspection along with Mobile No.:	
MQP Doc. No.: **Rev. No.:** **MQP Approval Status:**	**Yes / No**
Inspection Reference Document No: **(Drawing/ Data Sheet etc.) approval status**	**Yes / No**
Tata Power PO Item numbers / Billing Breakup No./ Tag No (as applicable) and quantity to be inspected: (Please attach separate list if necessary)	
Current Manufacturing Status (in brief) of item / equipment being offered in this Inspection:	

We hereby confirm that the items have been fully inspected / tested by us, all stages of inspection as per approved MQP have been done and all material test certificates, Q.C. records, approved Drawing / Data Sheet, test reports and valid calibration reports of measuring / testing instruments with traceability are ready with us.

(Signature)

[Name & Designation of Contractor's Representative]

Specification No.-TE00606/SP/0039/FY26

Annexure-1

11kV AIS Switchgear Replacement at Bhira for PH-2, 5 & BPSU

Billing break up for EPC package-Overall BOQ

Design, Engineering, Manufacturing and Testing at Manufacturer's works, packing and forwarding, transport, insurance during transit, delivery in good condition at site, storage at site, handling at site, Erection, Testing after Erection, commissioning, performance testing and handing over of the following:

EPC for 11kV AIS Replacement at Bhira Hydro Station:Tentative BOQ-R0

Item	Description	UOM	Qty
B2.1	**SITC of 11 kV AIS Switchgear for U#2, U#5 & BPSU. (ENGG/ELEC/STD-SPEC/2018/48))+Refer Annexure-2 for billing break-up**	**Lot**	**1**
B2.2	**SITC of Control, Protection and Automation (Separate panel for BPSU Switchgear Panels). (ENGG/ELECT/STD-SPECS/70)+Refer Annexure-2 for billing break-up.**	**Lot**	**1**
B2.3	**SITC OF STATION AUTOMATION SYSTEM Refer Annexure-4 for billing break-up**	**Lot**	**Services as indicated in Sec. A**
B2.4	**SITC OF COMMUNICATION SYSTEM Refer Annexure-5 for billing break-up**	**Lot**	**Services as indicated in Sec. A**
B2.5	**SITC OF BALANCE OF PLANT (TE00606/SP/0039/FY26)+Refer Annexure-6 for billing break-up**		
B2.5.1	Miscellaneous Support Structures and fixtures for all equipment	**Lot**	**1**
B2.5.2	Miscellaneous ITEMS-SAFETY EQUIPMENT, BOARDS, LOTO ETC.	**Lot**	**1**

Scope for extended warranty

Item	Description	UOM	Qty
B2.6	Scope of works for activities under extended warranty:11kV Switchgear & Relay control Panel	Lumpsum (cost for 05 years)	1

Scope for Statutory approvals

Item	Description	UOM	Qty
B2.7	Statutory Electrical inspectors' approval for all electrical installations under the project: required for installation, commissioning and load service of new 11kV Bhira AIS project	Lumpsum	1

	Grand Total		
	GST		
	Grand Total Incl Taxes		
	Grand Total Incl Taxes (In words)		

Note: This pricec schedule is for the purpose of price breakup only. Scope of works is as per the Scope and specification documents provided in the tender.

Specification No.-TE00606/SP/0039/FY26

Annexure-2

11kV AIS Switchgear Replacement at Bhira for PH-2, 5 & BPSU

Billing break up for 11 kV AIS

Design, Engineering, Manufacturing and Testing at Manufacturer's works, packing and forwarding, transport, insurance during transit, delivery in good condition at site, storage at site, handling at site, Erection, Testing after Erection, commissioning, performance testing and handing over of the following

Item	Description	Unit	Nos.	Unit Price	Total Price (Rs.)
1	**11 kV AIS with bus bar rating of 630A, 25 kA, 3 Sec for BPSU Swithcgear:**				
1.1	Incomer-off load isolator, 1250A Suitable for Cable connection of 3x1Cx185 Sq.mm XLPE Cable.	No.	1		
1.2	Bus PT#1 (11000V/√3 - 110V/√3/110V/√3; 100VA- Cl-0.2S; 75VA- CL 3P) (with Open delta Protection Relay).	No.	1		
1.3	11kV Surge Arrestor (3 phase; 10kA Class-3)	No.	1		
1.4	Outgoing feeder with Breaker & with Surge Arrestor for Unit Auxiliary Transformer 1250A Suitable for Cable connection of 3x1Cx185 Sq.mm XLPE Cable along with PT: **PT:** (with Phase - phase PT for VPIS, U/V & O/V alarm) 11000V/√3/110V/√3/110V/√3; 100VA- Cl-0.2S; 75VA- CL-3P. **CT - 1:** (1 phase): 200/5A; 20VA Cl. 0.2S. **CT - 2:** (3 phase): 1000/5A, 20VA Cl. 5P20.	No.	1		
1.5	Outgoing feeder with Breaker & with Surge Arrestor for Excitation Transformer 1250A Suitable for Cable connection of 3x1Cx185 Sq.mm XLPE Cable along with PT: **PT:** (with Phase - phase PT for VPIS, U/V & O/V alarm) 11000V/√3/110V/√3/110V/√3; 100VA- Cl-0.2S; 75VA- CL-3P. **CT – 1:** (1 phase): 200/5A; 20VA Cl. 0.2S. **CT – 2:** (3 phase): 1000/5A, 20VA Cl. 5P20.	No.	1		
2	**11 kV AIS with bus bar rating of 630A, 25 kA, 3 Sec for BPSU ICOG Swithcgear:**				
2.1	Incomer : off-load Isolator – 1250A Suitable for Cable connection of 3x1Cx185 Sq.mm XLPE Cable from Old Power house. (Additional Cable cubicle required for Back2Back Cable connections for cable coming from OPH).	No.	1		
2.2	Line PT#1 (11000V/√3 - 110V/√3/110V/√3; 100VA- Cl-0.2S; 75VA- CL 3P) (with Open delta Protection Relay).	No.	1		
2.3	Outgoing feeder with Breaker with Surge Arrestor for Station Transformer 1250A Suitable for Cable connection of 3x1Cx185 Sq.mm XLPE Cable along with PT: **PT:** (with Phase - phase PT for VPIS, U/V & O/V alarm) 11000V/√3/110V/√3/110V/√3; 100VA- Cl-0.2S; 75VA- CL-3P. **CT - 1:** (1 phase): 200/5A; 20VA Cl. 0.2S. **CT - 2:** (3 phase): 2000/5A, 20VA Cl. 5P20.	No.	1		
3	**11 kV AIS with bus bar rating of 2000A, 25 kA, 3 Sec for PH#2 Swithcgear:**				
3.1	**Incomer # 1- From Generator #2 Cubicle-(Consists of following separate panels).**	No.	1		
3.1.1	Generator Incomer: 2500A With Line PT 11000V/√3/110V/√3/110V/√3 100VA- Cl-0.2S; 75VA- CL 3P CT – 2000/5A-5A; 5P20 25VA & 0.2S Class.	No.	1		
3.1.2	Generator surge cubicle (Shall have 3 Single Phase PT - 11000V/√3/110V/√3/110V/√3 100VA- Cl-0.2S; 75VA- CL 3P) (As per existing GA-Please refer Panel-1A drawings in Annexure-1)	No.	1		
3.1.3	Generator surge cubicle (Provision for termination of Excitation Transformer cable of size 3Cx185 Sq.mm 1 Run). As per existing GA-Please refer Panel-1B drawings in Annexure-1	No.	1		
3.1.4	Generator cable compartment as per exisiting GA Drawing: [With CT 2000/5A-5A-5A (2 core PS Class & 1 Core 5P20, 25VA)] Provision for terminating 9x1Cx630 Sq. mm. XLPE Cable (per phase 3 Runs).	No.	1		
	Dummy Panel				
3.2	Disconnector to 30MVA Generator Transformer. 2500A Off-load Isolator. (With CT – 2000/5A-5A: 25VA 5P20 & PS Class) Suitable for Bus-duct connection (bottom entry). SPBD Cubicle size 360x580 mm with copper Bus Bar of 3x100x6mm	No.	1		
3.3	Bus PT #1 (3 no. Single Phase - 11000V/√3/110V/√3/110V/√3; 100VA- Cl-0.2S; 75VA- CL 3P). With open Delta Protection Relay.	No.	1		
3.4	Bus PT#2 (Ph-Ph). 11000V/√3/110V/√3/110V/√3; 100VA- Cl-0.2S; 75VA- CL 3P.	No.	1		
3.5	Surge arrester for Generator Surge Cubicles. (3-Ph) 10kA, Class-3	No.	1		

3.6	Outgoing Breaker feeder 1250A - Station Transformer # 1. (with Surge Arrestor) suitable for termination of 1x3Cx300 Sq. mm XLPE Cable. **PT:** (with Phase - phase PT for VPIS, U/V & O/V alarm) 11000V/√3/110V/√3/110V/√3; 100VA- Cl-0.2S; 75VA- CL 3P **CT - 1:** 100-200/5/5A; 25VA Cl. 0.2S **CT - 2 & 3:** 2000/5-5A, 25VA 5P20 & PS.	No.	1		
3.7	Outgoing Breaker feeder 1250A – 3 MVA Distribution Transformer. (with Surge Arrestor).suitable for termination of 1Run of 3Cx300 Sq. mm XLPE Cable. **PT:** (with Phase - phase PT for VPIS, U/V & O/V alarm) 11000V/√3/110V/√3/110V/√3; 100VA- Cl-0.2S; 75VA- CL 3P. **CT - 1:** 200-300/5/5A; 25VA Cl. 0.2S. **CT - 2 & 3:** 2000/5-5A, 25VA 5P20 & PS.	No.	1		
3.8	Outgoing Breaker Feeder- 1250A - PSU station Trafo. (with Surge Arrestor). Suitable for Termination of 2Runs of 3x1C185 Sq. mm XLPE Cable. **PT:** (with Phase - phase PT for VPIS, U/V & O/V alarm) 11000V/√3/110V/√3/110V/√3; 100VA- Cl-0.2S; 75VA- CL 3P. **CT - 1:** 100-200/5/5A; 25VA Cl. 0.2S. **CT - 2 & 3:** 2000/5-5A, 25VA 5P20 & PS.	No.	1		
4	**11 kV AIS with bus bar rating of 2000A, 25 kA, 3 Sec for PH # 5 Swithcgear:**				
4.1	**Incomer # 1- From Generator # 5 Cubicle-(Consists of following separate panels).**	No.	1		
4.1.1	Generator Incomer: 2500A With Line PT 11000V/√3/110V/√3/110V/√3 100VA- Cl-0.2S 75VA- CL 3P CT – 2000/5A-5A; 5P20 25VA & 0.2S Class.	No.	1		
4.1.2	Generator surge cubicle (Shall have 3 Single Phase PT - 11000V/√3/110V/√3/110V/√3 100VA- Cl-0.2S 75VA- CL 3P) (As per existing GA-Please refer Panel-1A drawings in Annexure-1)	No.	1		
4.1.3	Generator surge cubicle (Provision for termination of Excitation Transformer cable of size 3Cx185 Sq.mm 1 Run). As per existing GA-Please refer Panel-1B drawings in Annexure-1	No.	1		
4.1.4	Generator cable compartment as per exisiting GA Drawing: [With CT 2000/5A-5A-5A (2 core PS Class & 1 Core 5P20, 25VA)] Provision for terminating 9x1Cx630 Sq. mm. XLPE Cable (per phase 3 Runs).	No.	1		
	Dummy Panel				
4.2	Disconnector to 30MVA Generator Transformer. 2500A Off-load Isolator. (With CT – 2000/5A-5A: 25VA 5P20 & PS Class) Suitable for Bus-duct connection (bottom entry). SPBD Cubicle size 360x580 mm with copper Bus Bar of 3x100x6mm	No.	1		
4.3	Bus PT #1 (3 no. Single Phase - 11000V/√3/110V/√3/110V/√3; 100VA- Cl-0.2S; 75VA- CL 3P). With open Delta Protection Relay.	No.	1		
4.4	Bus PT#2 (Ph-Ph). 11000V/√3/110V/√3/110V/√3; 100VA- Cl-0.2S; 75VA- CL 3P.	No.	1		
4.5	Surge arrester for Generator Surge Cubicles. (3-Ph) 10kA, Class-3	No.	1		
4.6	Outgoing Breaker feeder 1250A - Station Transformer # 1. (with Surge Arrestor) suitable for termination of 1x3Cx300 Sq. mm XLPE Cable. **PT:** (with Phase - phase PT for VPIS, U/V & O/V alarm) 11000V/√3/110V/√3/110V/√3; 100VA- Cl-0.2S; 75VA- CL 3P **CT - 1:** 100-200/5/5A; 25VA Cl. 0.2S **CT - 2 & 3:** 2000/5-5A, 25VA 5P20 & PS.	No.	1		
4.7	Outgoing Breaker feeder 1250A – 3 MVA Distribution Transformer. (with Surge Arrestor).suitable for termination of 1Run of 3Cx300 Sq. mm XLPE Cable. **PT:** (with Phase - phase PT for VPIS, U/V & O/V alarm) 11000V/√3/110V/√3/110V/√3; 100VA- Cl-0.2S; 75VA- CL 3P. **CT - 1:** 200-300/5/5A; 25VA Cl. 0.2S. **CT - 2 & 3:** 2000/5-5A, 25VA 5P20 & PS.	No.	1		
4.8	Outgoing Breaker Feeder- 1250A - PSU station Trafo. (with Surge Arrestor). Suitable for Termination of 2Runs of 3x1C185 Sq. mm XLPE Cable. **PT:** (with Phase - phase PT for VPIS, U/V & O/V alarm) 11000V/√3/110V/√3/110V/√3; 100VA- Cl-0.2S; 75VA- CL 3P. **CT - 1:** 100-200/5/5A; 25VA Cl. 0.2S. **CT - 2 & 3:** 2000/5-5A, 25VA 5P20 & PS.	No.	1		
5	**Stand alone CRP for BPSU Switchgear:**				
5.1	Common Protection & Control Panel for 11kV Switchgear indicated in Table 1 & Table 2 above. (Shall House Control Switches, Numerical Relays, BCPU, Metering, Auxiliary Relays, Annunciation, indication & SAS connectivity as required).	No	1		

6	**Mandatory Spares -** Essential/Mandatory Spares as per Section 11.0 Details indicating unit prices to be submitted separately. Lump sum price to be indicated here.	Lot	1		
7	**Recommended Spares -** Recommended Spares by manufacture Details indicating unit prices to be submitted separately. Lump sum price to be indicated here.	Lot	1		
8	Special Erection / Maintenance Tools & Tackles Details indicating unit prices to be submitted separately. Lump sum price to be indicated here.	Lot	1		
9	**Erection, testing & commissioning**				
A	Erection, testing & commissioning of per AIS bay & including all the accessories with complete material handling and material management at site.	Lot	1		
10	**Other Requirements:**				
A	**(pls. mention as required for the project)**	Set	1		
	Total Price				
	Notes:				
1	Any other item and accessories not specified above but necessary to complete the AIS commissioning has to be provide by Bidder. A separate list with rate and cost of the same shall be provided by AIS Bidder.				

Specification No.-TE00606/SP/0039/FY26

Annexure - 6

11kV AIS Switchgear Replacement at Bhira for PH-2, 5 & BPSU

Billing break up for BALANCE OF PLANT(BOP) SYSTEM

Design, Engineering, Manufacturing and Testing at Manufacturer's works, packing and forwarding, transport, insurance during transit, delivery in good condition at site, storage at site, handling at site, Erection, Testing after Erection, commissioning, performance testing and handing over of the following

Sr No	Equipment description	Tentative Quantity	Unit Price	Total Price (Rs.)
	SITC of following equipment as per specifications			
1	**LV CABLES**			
1.1	LV Power cables, Aluminum, XLPE, Armored (1.1 kV Class) as per standard specification.	Not in Scope		
1.2	Control / Instrumentation / SCADA cables, Copper, PVC, Armoured (1.1 kV Class)	1 Lot		
2	Safety Equipment's	1 Lot		
3	Boards at each floor	1 Lot		
	• MV/LV SLD boards for the scope			
	• SLD LOTO Key boards			
	• Tool arrangement boards			
4	LOTO accessories	1 Lot		
5	Safety Signage boards	1 Lot		
6	Safety tools & tackles	1 Lot		
7	Spares for electrical auxiliaries (As per standard specification mention in Section-B for each equipment/ system within battery limit)	1 Lot		
8	Supply of ISI marked 11 kV and 1.1 kV insulating mats as per IS 15652 as per specifications	1 Lot		
9	Supply and installation of metal nameplates per feeder as per Tata Power standard requirement as per specification	1 Lot		
10	Other miscellaneous material, resources, activities as per specifications issued and required for completion of Balance of Plant job scope.	LS		
11	Housekeeping and cleaning/removal of waste material like big rocks and excavated soil, solar panel pallets, plastic waste, wooden material & any other scrap material at sites shall be removed/disposed from plant.	1 LOT		
12	It is complete liability of contractor for disposing of material undisputedly outside the plant area.			
13	Construction Power supply equipment/system.	1 LOT		

Title: Guideline of ferruling for Inter-panel Wiring.	Page 1 of 5

Purpose:

To standardize the ferrule description while doing the inter panel wiring or even during relay replacement.

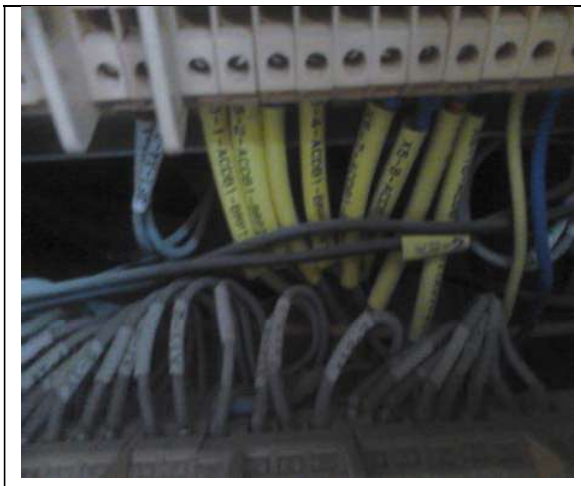
Why there is mismatch or lengthiness in ferruling:

- *Each person looks differently for same thing for ferruling.*
- *Control circuit, relays, contactors, devices etc are of different manufacturers. And have the different name.*

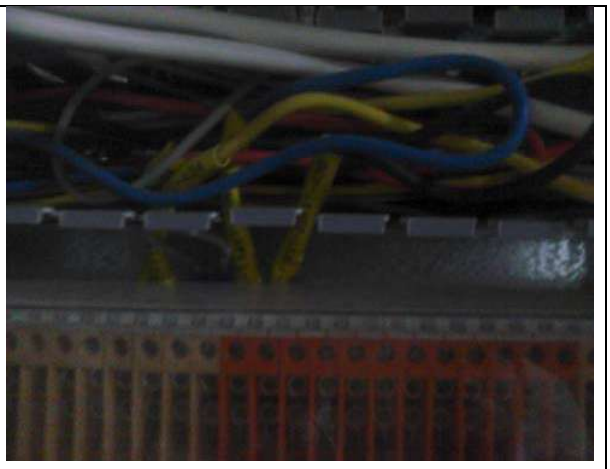
How standardization benefits:

- *Standard description.*
- *Minimise the length.*
- *Minimise the errors as shown in figure 4 below.*
- *If length of the ferrule increases, it is difficult to insert into wires, so for 2.5 sq.mm wire somewhere it is required to use 4sq.mm tube for ferrule printing. This will be avoided.*
- *By using short forms of description, size of ferrule can be reduced.*

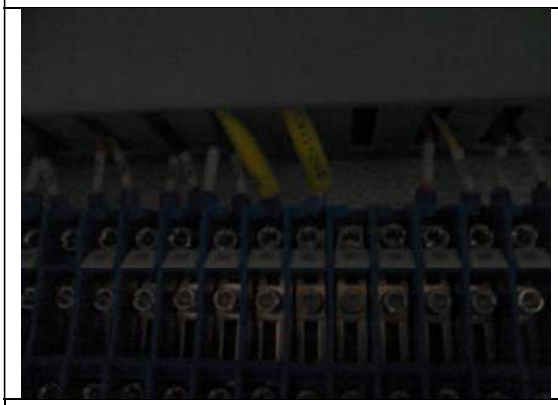
Some of the points noticed here with pictorial representation:



1. To avoid the lenthiness of the ferrule



2. Some part hides in wire trays if long ferrule used.

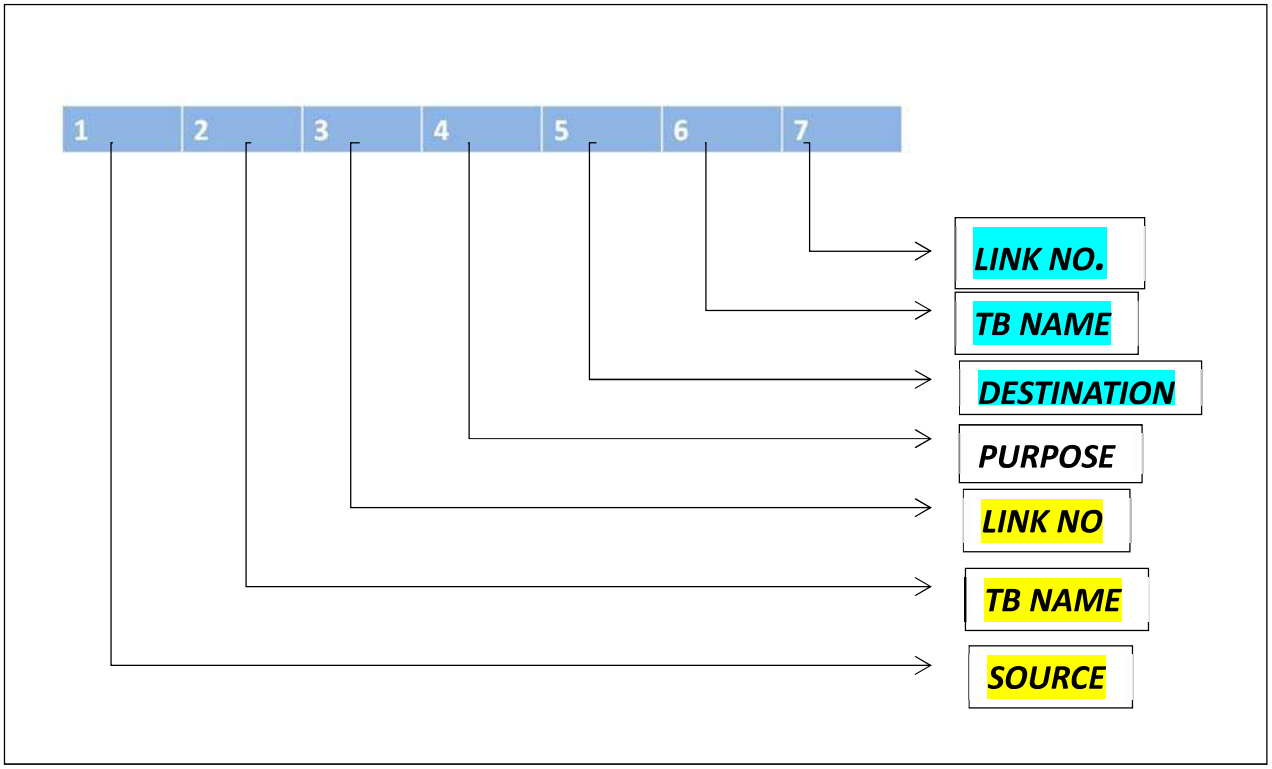


3. Ferrule half outside half inside the tray

4. Sequence of ferruling is wrong as it should start from 1A at TB termination.

WAY TO STANDARDISE

Design of the ferrule:



1. *Write the Source Panel/MB ID from where the wire starts.*
2. *Write the Terminal box identification from where wire starts.*
3. *Write down the Link no of the above TB where from where wire starts.*
4. *Write the Purpose of wire i.e. for which function wire belongs to.*
5. *Write the Destination where wire goes to.*
6. *Write the Destination TB identification.*
7. *Write Link no of point no 6, i.e. to where it exactly terminates.*

SHORT FORMS

Short forms to be used For PURPOSE:

SR.NO.	DESCRIPTION	SHORT FORM
1	DC Circuit	DC
2	AC Circuit	AC
3	CT Circuit	CT
4	PT Circuit	PT
5	Alarm Circuit	ALRM
6	Trip Circuit	TRIP
7	Interlock Circuit	INTL

Examples:

1. ***Suppose wiring is from LCP-1 (X3 211, 212) goes to RP101 Incomer Panel for Closing Interlock (X1 540,541).***

At LCP end

RP101/	X1/	540/	INTL/	LCP1/	X3/	211

at RP End

LCP1/	X3/	211/	INTL/	RP101/	X1/	540

At LCP end

RP101/	X1/	541/	INTL/	LCP1/	X3/	212

at RP End

LCP1/	X3/	212/	INTL/	RP101/	X1/	541

2. ***Suppose Inter panel wiring is from Transformer 1 Marshalling box (TB no X1-11) goes to RP103 TB no X1-539 for Buchholz alarm.***

At Trf MB end

RP103/	X1/	539/	ALRM/	TRMB/	X1/	11

At RP End

TRMB/	X1/	11/	ALRM/	RP103/	X1/	539

3. Suppose Inter panel wiring is from BUS PTMB X11:1,2 goes to RTCC panel X1- 1, 2.

At PTMB end

RTCC/	X1/	1/	PT/	PTMB/	X11/	1

At RP End

PTMB/	X11/	1/	PT/	RTCC/	X1/	1

At PTMB end

RTCC/	X1/	2/	PT/	PTMB/	X11/	2

at RP End

PTMB/	X11/	2/	PT/	RTCC/	X1/	2

4. Suppose Inter panel wiring is from CTMB X1:9, 10 To RP103 X1:1, 2, for Differential Relay CT Circuit.

At CTMB end

RP103/	X1/	1/	CT/	CTMB/	X1/	9

at RP End

CTMB/	X1/	9/	CT/	RP101/	X1/	1

At PTMB end

RP103/	X1/	2/	CT/	CTMB/	X1/	10

at RP End

CTMB/	X1/	10/	CT/	RP101/	X1/	2

Standard List of Suppliers
(Manufacturer List For Transmission Projects).

(To be attached with Specifications).

TPQAIT-QAXX-00-EX-SLS-001. Rev.1

Meant for (Internal Circulation / External – Stakeholders Circulation)

Rev No.	Reason for Revision	Prepared By	Checked By	Approved By
		Srinivas Reddy	Ravindra Patil	G T Jawale
R2	Revised for Bhira 11kV Switchgear			
R1	Revised for Salsette 245kV GIS			

Manufacturer Master List

Sr No.	Product / Material description	Manufacturer Name	Factory Location	Range / Type/ Size/ Rating	REMARKS
1	6.6kV, 11kV, 22kv & 33 kV Switchgear (AIS)	ABB Limited	Nashik	upto 33kV	
		Siemens Limited	Kalwa	upto 33kV	
		Crompton Greaves Ltd. (Only 11 KV)	Nashik	11KV	
		Schneider Electric India Pvt. Ltd.	Vadodra;Kolkata	11K / 6.6KV	
2	LV Switchgear (ACDB / MLDB / DCDB/ MCC/ PCC).	L&T (LK)	Ahmednagar	415V /220V (DC)	
		Siemens Limited	Kalwa, Mumbai	415V /220V (DC)	
		Schneider Electric India Pvt. Limited	Vadodra;Kolkata	415V /220V (DC)	
		ABB Ltd.	Bangalore	415V /220V (DC)	
		Control & Switchgear (C&S)	Noida	415V /220V (DC)	
		MK Engineers	Mumbai	415V /220V (DC)	
		GE Power Controls	Chennai	415V /220V (DC)	
		Masstech Controls Pvt. Limited.	Jalgaon	415V /220V (DC)	
		Popular Switchgear.	Nasik	415V /220V (DC)	Not to be considered
		Dharia Switchgear.	Mumbai	415V /220V (DC)	
		Ultima switchgear	Roorkee	415V /220V (DC)	
		Nitya Electro controls	Noida	415V /220V (DC)	
3	1.1 kV Power Cables & LT Power Cables	KEC International	Vadodara	up to 1.1KV	NABL accredited lab
		Universal Cables Limited	Satna, MP	up to 1.1KV	
		Finolex	Pune	up to 1.1KV	
		Nicco Corporation Limited	Kolkata	up to 1.1KV	
		Polycab	Silvassa, Vapi	up to 1.1KV	
		Ravin Cables	Pune	up to 1.1KV	
		Gemscab Industries	Alwar, Rajastan	up to 1.1KV	
		APAR Industries	Umbergaon, Valsad	up to 1.1KV	
		Gupta Cables.	Kashipur, New Delhi	up to 1.1KV	Not NABL
		Dynamic cables	Unit IV, Reengus, Jaipur	up to 1.1KV	Not NABL
		KEI Cables	Bhiwadi, RJ	up to 1.1KV	NABL accredited lab
		CCI	Nashik	up to 1.1KV	
		Suyog cables	Vadodara	up to 1.1KV	
		Paramount	Noida	up to 1.1KV	
		K C Powertracks	Silvassa	up to 1.1KV	
		Diamond Power infrastructure Limited	Halol Vadodara	up to 1.1KV	
		Ultracab cables	Rajkot	up to 1.1KV	
		Special Cables	Rudrapur	up to 1.1KV	Doc. Reviewed. Supplying TPSSL, TATA Steel & TPL.
		Havells	Bhiwadi, RJ	up to 1.1KV	
		Torrent Cables	Nadiad	up to 1.1KV	
		Chandresh Cables (AVOCAB)	Gandhinagar	up to 1.1KV	Supplied to BESCOM
		Cords Cables Industries Ltd.	Bhiwadi, RJ	up to 1.1KV	
		Torrent	Nadiad	up to 1.1KV	
		Zenium	Silvassa, Vapi	up to 1.1KV	
4	Control Cables	KEC International	Vadodara	up to 1.1KV	
		Universal Cables Limited	Satna, MP	up to 1.1KV	
		Finolex	Pune	up to 1.1KV	
		Torrent	Nadiad	up to 1.1KV	
		Nicco Corporation Limited	Kolkata	up to 1.1KV	
		Ravin Cables	Pune	up to 1.1KV	
		Reliance Engineers	Bangalore	up to 1.1KV	
		Cords Cable Industries Ltd.	New Delhi	up to 1.1KV	
		Thermo Cables	Jadcherla, Hyderbad	up to 1.1KV	
		Miracle Cables	Mumbai	up to 1.1KV	
		Suyog cables	Vadodara	up to 1.1KV	
		Paramount	Noida	up to 1.1KV	
		K C Powertracks	Silvassa	up to 1.1KV	
		Zenium	Silvassa, Vapi	up to 1.1KV	
		Polycab	Silvassa, Vapi	up to 1.1KV	
		Diamond Power infrastructure Limited	Halol Vadodara	up to 1.1KV	
		Ultracab cables	Rajkot	up to 1.1KV	
		Special Cables	Rudrapur	up to 1.1KV	Doc. Reviewed. Supplying TPSSL, TATA Steel & TPL.
		Gemscab Industries	Rewadi	up to 1.1KV	
5	Instrumentation Cables	Reliance Engineers	Bangalore	up to 650 V	
		Associated Cables	Chiplun, MH	up to 650 V	
		Udey Pyrocables	Pune	up to 650 V	
		Cosmotec Communication Products Pvt. Ltd. (for Belden make)	Mumbai	up to 650 V	
		Lapp	Pune	up to 650 V	
		Thermo Cables	Jadcherla, Hyderbad	up to 650 V	
		Polycab	Silvassa, Vapi	up to 650V	
		Cords Cables Industries Ltd.	Bhiwadi, RJ	up to 650 V	

6	OFC cable	KEC International	Mysore	up to 96 F	
		APAR Industries	Silvassa, Vapi	up to 96 F	
		Sai Network	Silvassa, Vapi	up to 96 F	
		Finolex cable	Umbergaon, Valsad	upto 6 Core for DTS.	
		Birla Cables	Katni, MP	up to 96 F	
		SIEMENS Public Communication Networks Ltd.	Pondicherry		
		AFL Global Ltd	Germany		
		Kotak Exim Pvt. Ltd. (for Jiangsu Tongguang Optical Fiber Cable Co Ltd.)	Mumbai / China		
		Suzhou Furukawa Power Optic Cable Co Ltd.	China		
		Anmol Solutions Pvt. Ltd. (for Tahian Fiberoptics Co Ltd.)	Gurgaon / South Korea		
		Alpasso IndiaPvt.Ltd(for LG CableKorea)	New Delhi / Korea		
		Hengtong Optic - Electric Co Ltd.	China		
		AFL Global Ltd.	UK / Germany-Europe		
7	Cable Trays & Accessories	Indiana	Pune		
		Reliance	Nasik		
		Patni	Hydrabad		
		Sadhna	Mumbai		
		Unitech	Gurgaon		
		Shruti Industries	Pune		
		Ratan Projects	Kolkata		
		Profab	Mumbai		
		Shivanjali	Vadodara		
		Sterlite	Pune		
8	LT CT / PT (Cast resin)	AE	Mumbai	415V	
		Kappa	Chennai	415V	
		Translec engineers	Mumbai	415V	
		Electrical Control & Systems	Vadodara	415V	
		RECO	Mumbai	415V	
		Maxwel - gilbert	Nasik	415V	
		Huphen Fabricator	Nasik	415V	
		Huphen Electromech	Nasik	415V	
		Indcoil	Chennai	415V	
		Pragati	Thane, Mumbai	415V	
9	Indicating Meters (Digital type)	Automatic Electric.	Mumbai		
		Toshniwal.	Mumbai		
		Secure Meters.	Udaipur		
		Meco Instruments.	Mumbai		
10	Indicating meter (Analog type)	Automatic electric	Mumbai		
		Meco	Mumbai		
		Rishab instruments	Nasik		
		M.B. Controls	Kolkata		
		Motwani	Nashik		
		Secure	Gurgaon		
11	MFM	Satec	Udaipur	PM130EH+	
		Secure	Gurgaon		
12	Revenue Meters (KWH/TVM)	Secure	Udaipur	Premier 300	
		L&T (LK)	Mysore	ERP 300	
13	Protection (CRP), Automation & Communication System.	GE	Chennai		Main I & Main II Relays Shall be different Algorithm.
		ABB	Bangalore		
		Siemens	Goa.		
		Schweitzer Laboratories Ltd (SEL)	Bangalore		
		Schnedier	Vadodara		
		Toshiba T&D	HYderabad		
		Ashida	Mumbai	for Non-critical	
14	Auto Synchroniser	ABB Ltd	Bangalore		
		GE	Chennai		
		Siemens Ltd	Bangalore		
15	ABT Metering Panel	Siemens	Kalwa, Mumbai		
		Pyrotech	Udaipur		
		CGL	Vadodara		
		Alstom	Chennai		
16	Panel Enclosures	Rittal	Bangalore	for CRP/SAS.	
		Technitron	Mumbai	for CRP/SAS.	
		Pyrotech	Udaipur	Except CRP.	
17	Relays.	L&T (LK)	Hosure	110V/220V DC	
		Easun Reyrolle	Bangalore	110V/220V DC	
		GE	Bangalore	110V/220V DC	
		Alstom	Chennai	110V/220V DC	
		ABB	Bangalore	110V/220V DC	
		Ashida	Thane	for Distribution only	
		Schneider	Vadodara	for Distribution only	

		C&S	Vadodara	for EV RMU only	
		Siemens	Kalwa, Mumbai	110V/220V DC	
18	Earthing Rubber mats	DEEP JYOTI RUBBER PRIVATE LIMITED			
		JYOTI RUBBER UDYOG (INDIA) LIMITED			
19	LTP	Prashant electricals	Boisar	415V	
		Banavathy	Bangalore	415V	
		Gourav Energen	Bareily	415V	
		Popular Switchgear	Nashik	415V	
		Dharia Switchgear.	Dombivali	415V	
		Ener	Vadodara	415V	
		Positronics	Vadodara	415V	
		Transcon Power	Rudrapur	415V	
20	Cable glands & Lugs	Comet			
		Omega			
		3M			
		Dowell			

Panel Components

Sr No.	Product / Material description	Manufacturer Name	Factory Location	Range / Type/ Size/ Rating	
1	LT ACB	C&S	New Delhi	2000A, 50KA	
		L&T (LK)	Ahmednagar		
		Schnedier	Vadodara		
		GE	Chennai		
		ABB	Vadodara		
		Siemens	Mumbai		
		HPL		2000A, 50KA	
		Havells		2000A, 50KA	
2	MCB/ MCCB / MPCB/ RCCB	Siemens			
		MDS			
		GE			
		L&T (LK)			
		Indo Asian			
		C&S			
		Schneider			
		ABB			
3	Relays.	L&T (LK)	Hosur	110V/220V DC	
		Easun Reyrolle	Bangalore	110V/220V DC	
		GE	Bangalore	110V/220V DC	
		Alstom	Chennai	110V/220V DC	
		ABB	Bangalore	110V/220V DC	
		Siemens	Kalwa, Mumbai	110V/220V DC	
5	Interposing Relays (For Command Output To MCC)	Alstom	Chennai	upto 220V AC/DC	
		Omron	Mumbai	upto 220V AC/DC	
		Jyoti	Pune	upto 220V AC/DC	
		National	Ireland	upto 220V AC/DC	
		OEN	Bangalore	upto 220V AC/DC	
6	LT Fuses (HRC)	Siemens			
		L&T (LK)			
		GE			
		ABB			
		Schneider			
		HPL			
		Eaton			
		C&S			
7	Timer	Siemens			
		BCH			
		L&T (LK)			
		Schneider			
8	Push Buttons	Siemens			
		L&T (LK)			
		BCH			
		Schneider			
		Binay			
		Kaycee			
		Tecnic			
		GE			
9	LED indicating lamps	Schneider			
		GE			
		BCH			
		Binay			
		Tecnic			
		L&T (LK)			
		C&S			
10	Selector Switches & Control Switches	Siemens			
		Kaycee			
		L&T (LK)			
		Schneider			

11	SFU	Siemens			
		C&S			
		HPL			
		ABB			
		L&T (LK)			
		Schneider			
		GE			
12	Terminal Block	Connectwell	Type CDTTS, CBDT4UNS & CDTTU, 1100Volts Rated		
		Elmex	KLTDM4		
		Phoenix Contact		TB4 EI	
		DAV industries	Mumbai	4SF, 1000volts	
13	Finolex flexible fires	Finolex cables ltd.	Pune	1.1KV, 1.5 sqmm.	
		Techno flex cables	Thane		
		NEC wires & cables	Noida		
		RR Kabel			
14	Gasket	Dirak	Bengaluru	20x5-neoprene	
		R. k. Profiles	Ghaziabad	20x5, 20x10 -neoprene	
		Perfect Rubber Industries	Mumbai	20x5 & 20x 1.6	
15	CTs	Newtek electricals	Aurangabad		
		Indcoil transformers pvt.ltd.	Thane		
		Siemens			
		Satec Powerful solutions		1000/1	
		Pragati Electricals	Thane	3200/5	
		Reco Transformers	Lonavala		
16	VAF+PF Meter	L& T (LK)			
		Elmeasure	Coimbatore		
17	SS/CRCA sheet	AM/NS india	Surat	1.6, 2.0, 3.0mm	
		POSCO Maharashtra steel			
		JSW steel			
		TATA Steel	Jamshedpur		
18	Aluminium Busbar	Jindal Aluminium Ltd.			
		Banco Aluminium Ltd.	Vadodara		
19	Copper Busbar	Metallonics Global LLP	Nashik		
		S. metal industries			
		Supertech Conductors	Nashik	80X10 MM	
20	Thermostat	APT			
21	Space heater	Girish Co.			
22	PTs	Precise			
		Satec Powerful solutions			
23	Transducers	AE			
		Rishabh Instruments Pvt.Ltd.	Nashik		
24	Annunciators	Alan electronic system			
25	Analog & digital meter	Rishabh Instruments Pvt.Ltd.	Nashik		
		AE			
26	Toggle switch	Kaycee			
27	FRP sheet	ARC insulation & insulators			

Automation

Sr No.	Product / Material description	Manufacturer Name	Factory Location	Range / Type/ Size/ Rating	REMARKS
1	Bay Control Unit (BCU)	ABB (I) limited	Bengaluru		
		GE (T&D)	Chennai, Noida		
		Siemens Ltd	Mumbai, GOA		
2	Bay Control and Protection Unit (BCPU)	ABB (I) limited	Bengaluru		
		GE (T&D)	Chennai, Noida		
		Siemens Ltd	Mumbai, GOA		
3	Remote Terminal Unit (RTU)	ABB (I) limited	Bengaluru		
		GE (T&D)	Chennai, Noida		
		Siemens Ltd	Mumbai, GOA		
4	Gateway	ABB (I) limited	Bengaluru		
		GE (T&D)	Chennai, Noida		
		Siemens Ltd	Mumbai, GOA		
5	Disturbance Record Collector	Kalkitech	Bengaluru, Kochi		
6	Layer 2 & Layer 3 Ethernet Switch (SAS)	Ruggedcom / Hirschman / MOXA			
7	Firewall	Juniper/Cisco/Checkpoint/Palo Alto			
8	LIU (Fiber Optic)	Raychem / AFS / 3M			
9	I/O Boxes	Systimax / Tyco / CommScope			
10	Armored UTP CAT6 Cable	Systimax / Tyco / CommScope			
11	Armored Fiber Optic Cable	Finolex / KEC / Apar			

12	Unarmored UTP Cable	Systimax / Tyco / CommScope			
13	Patch Panel (RJ45) with Connectors, I/O boxes	Systimax / Tyco / CommScope			
14	Fiber Optic Patch Chords	Raychem / Preston / Tyco			
15	CAT6 UTP Patch Chords	Systimax / Tyco / CommScope			
16	4P X 0.36 Sq.mm. Armored Communication Cable (Multistrand, individual pair and overall shielded)	BELDEN / LAPP / SATYAM			
17	4P X 0.36 Sq.mm. Unarmoured Communication Cable (Multistrand, individual pair and overall shielded)	BELDEN / LAPP / SATYAM			
18	Fiber Optic Transceiver	CTC union / MRO TEK / Allied Telesis / MOXA			
19	GPS Clock with remote display unit	Sertel / Masibus / SANDS/Meinberg			
20	Gateway / DRCA/RTU/Network Panel (SAS)	Rittal			
21	RS 232 / RS 485 converter	MOXA / Advantech			
22	DC-DC Converter	Cossel / Phoenix / Paramount			
23	Diode-Oring Unit	Paramount / Phoenix			
24	Droppable type Terminal Block for Digital Output, CT&PT.	Connectwell – CBT4U or equivalent			
25	Disconnecting type (Knife edge) Terminal Block for Digital Input	Connectwell - CKT4U or equivalent			
26	Auxiliary Relays for Digital Outputs - BCU/RTU	Make – OMRON			
	Breaker	MM4XP-D			
	Isolator & other Digital Inputs	MM2XP-D			
27	Auxiliary Relays - Miscellaneous RTU	OMRON/OEN/Paramount			
28	Multifunction Meter	Make – SATEC			
		Model – PM130EH+			
29	Rack Mounted Sliding monitor with keyboard & Touch pad.	Make – ATEN			
30	Voltage Transducers	Make – RISHABH			
31	Modbus TCP/IP converter	Moxa, Advantech			
32	Configuration Laptop	HP/DELL/Lenovo			
33	Temperature & Humidity Sensor	Make & Model : KIMO & C-310			
34	SAS Panel Enclosures	Rittal	Bangalore		

Communication

Sr No.	Product / Material description	Manufacturer Name	Factory Location	Range / Type/ Size/ Rating	REMARKS
1	SDH Multiplexer	ABB (I) limited	Bengaluru		
2	VOIP Exchange	Alcatel	Mumbai		
3	L3 Stacked Network Switch	Allied Telesis	Mumbai		
4	OFC cable	APAR Industries	Mysore		
		Finolex cable	Umbergaon, Valsad		
		KEC			

		Birla Cables	Katni, MP		
5	OPGW cable	Kotak Exim Pvt. Ltd. (for Jiangsu Tongguang Optical Fiber Cable Co Ltd.)	Mumbai / China		
		Sterlite Power	Silvassa, Vapi		
		Suzhou Furukawa Power Optic Cable Co Ltd.	China		
		Anmol Solutions Pvt. Ltd. (for Tahian Fiberoptics Co Ltd.)	Gurgaon / South Korea		
		Alpasso India Pvt. Ltd. (for LG Cable, Korea)	New Delhi / Korea		
6	Public Address System	Haritasa	Bangalore		
		ABS	Bangalore		
		Philips	Pune		
		Bosch	Pune		
		Siemens	Bangalore		
		Gai-Tronics	UK		
		ME-Call Services	Nashik		
		Honeywell	Pune		
7	Fibre Optic Cable Accessories	Dipali Automation / Microscan / Ninesec / Orient			
8	Layer -3 Stack Switch Panel (Communication)	Valrack / Rittal			

Note:

1. Financial stability of the supplier to be verified before placing the order.
2. Wherever vendors are less than 2 or 3, equivalent vendors shall be evaluated, if required.