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SOUTHERN RAILWAY

ELECTRICAL TRACTION DISTRIBUTION BRANCH MDU DIVISION

TENDER No. U-TRD-OT-26-27-IV-1

TENDER DOCUMENT – PART 3 – APPENDICES

Tender for

**MDU DIVISION – PROVISION OF POWER QUALITY RESTORERS
FOR AC TRACTION SYSTEMS AT THE TRACTION
SUBSTATIONS IN PALANI, GOMANGALAM, MANAMADURAI,
RAMANATHAPURAM AND TENI**

Issued by

**Divisional Railway Manager (Electrical Traction Distribution),
Madurai Division, Southern Railway,
Madurai-625016**

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Appendix-A: Truthfulness of Documents Submitted

FORMAT FOR CERTIFICATE TO BE SUBMITTED / UPLOADED BY TENDERER ALONGWITH THE TENDER DOCUMENTS

I, (Name and designation) **appointed as the attorney/authorized signatory of the tenderer (including its constituents),

M/s _____ (hereinafter called the tenderer) for the purpose of the Tender documents for the work of _____ as per the tender No. _____ of _____ (Railway)** , do hereby solemnly affirm and state on the behalf of the tenderer including its constituents as under:

1. I/we the tenderer (s) am/are signing this document after carefully reading the contents.
2. I/We the tenderer(s) also accept all the conditions of the tender and have signed all the pages in confirmation thereof.
3. I/we hereby declare that I/we have downloaded the tender documents from Indian Railway website www.ireps.gov.in . I/we have verified the content of the document from the website and there is no addition, no deletion or no alteration to the content of the tender document. In case of any discrepancy noticed at any stage i.e. evaluation of tenders, execution of work or final payment of the contract, the master copy available with the railway Administration shall be final and binding upon me/us.
4. I/we declare and certify that I/we have not made any misleading or false representation in the forms, statements and attachments in proof of the qualification requirements.
5. **I/We also understand that my/our offer will be evaluated based on the documents/credentials submitted along with the offer and same shall be binding upon me/us.**
6. **I/We declare that the information and documents submitted along with the tender by me/us are correct and I/we are fully responsible for the correctness of the information and documents, submitted by us.**
7. I/we certify that I/we the tenderer(s) is/are not blacklisted or debarred by Railways or any other Ministry / Department of Govt. of India from participation in tender on the date of submission of bids, either in individual capacity or as a HUF/ member of the partnership firm/LLP/JV/Society/Trust.
8. I/we understand that if the contents of the certificate submitted by us are found to be forged/false or incorrect at any time during process for evaluation of tenders, it shall lead to forfeiture of the Bid Security and may also lead to any other action provided in the contract including banning of business for a period of up to two year. Further, I/we (insert name of the tenderer) ** _____ and all my/our constituents understand that my/our offer shall be summarily rejected.
9. I/we also understand that if the contents of the certificate submitted by us are found to be false/forged or incorrect at any time after the award of the contract, it will lead to termination of the contract, along with forfeiture of Bid Security/Security Deposit and Performance guarantee and may also lead to any other action provided in the contract including banning of business for a period of up to two year.
10. I/We have read the clause regarding restriction on procurement from a bidder of a country which shares a land border with India and certify that I am/We are not from such a country or, if from such a country, have been registered with the competent Authority. I/We hereby certify that I/we fulfil all the requirements in this regard and am/are eligible to be considered (evidence of valid registration by the competent authority is enclosed)

SEAL AND SIGNATURE OF THE TENDERER

Place:

Dated:

The contents in Italics are only for guidance purpose. Details as appropriate are to be filled in suitably by tenderer. **This affidavit is to be given by each member of JV.

Appendix - AA- Truthfulness of Documents Submitted (Partnership/JV/HUF/LLP)

(THIS CERTIFICATE IS TO BE GIVEN BY ATTORNEY/AUTHORIZED SIGNATORY/EACH MEMBER OF
PARTNERSHIP FIRM/JOINT VENTURE (JV) / HINDU UNDIVIDED FAMILY (HUF) / LIMITED LIABILITY
PARTNERSHIP (LLP) ETC.)

I/We, (Name) attorney/authorized signatory of the (Constituent firm/ constituent partner) and member/partner of the (tendering firm) hereby solemnly affirm and state as under:

1. I/we certify that (Constituent firm/ constituent partner)) is/are not blacklisted or debarred by Railways or any other Ministry / Department of Govt. of India from participation in tender on the date of submission of bids, either in individual capacity or as a HUF/member of the partnership firm/LLP/JV/Society/Trust.
2. I/We have read the clause regarding restriction on procurement from a bidder of a country which shares a land border with India and certify that I am/We are not from such a country or, if from such a country, have been registered with the competent Authority. I/We hereby certify that I/we fulfil all the requirements in this regard and am/are eligible to be considered (evidence of valid registration by the competent authority is enclosed)

SEAL AND SIGNATURE OF THE CONSTITUENT FIRM/CONSTITUENT PARTNER

Place:
Dated:

Appendix – B - Southern Railway Electronic Fund Transfer

(TO BE ATTACHED ALONG WITH THE TENDER)

Unique Contractor / Vendor code:

1	Investor/Customer's Name and Address EMAIL ID Telephone No.	
2	<u>Particulars of Bank account:</u>	
a)	Name of the Bank	
b)	Name of the Branch Address and Telephone No.	
c)	9 digit code number of the Bank and Branch appearing on the MICR cheque issued by the Bank	
d)	IFSC Code of the branch	
e)	Type of account (Current/Savings/Cash Credit with code 10/11/13)	
f)	Ledger and ledger folio No.	
g)	Account Number (appearing on cheque Book)	

(In lieu of the bank certificate to be obtained as under, please attach a bank cancelled cheque or photo copy of a cheque or front page of your saving pass book issued by your bank for verification of the above particulars)

3. Date of effect

I hereby declare that the particulars given above are correct and complete. If the transaction is delayed or not effected at for reasons of the incomplete or incorrect information, I would not hold the user institution responsible. I have read the option invitation letter and agree to discharge the responsibility expected of me as a participant under the scheme.

Date:

Signature of the Investor/Customer

Certificate that the particulars furnished above are correct as per our records.

Bank's stamp

Signature of the Authorized official of the Bank

Appendix – C - Declaration on Non-Association of Retired Railway Employee

FORMAT FOR DECLARATION TO BE UPLOADED BY TENDERER ALONGWITH THE TENDERDOCUMENTS
IF NO RETIRED RAILWAY EMPLOYEE IS/ARE ASSOCIATED WITH THE FIRM

I/We, _____ hereby declare that, as per instructions contained in Clause No. 16 of Annexure I of Part I and Clause No. 59(9) of Part II of Indian Railways Standard General Conditions of Contract, no retired Railway employees are associated with my/our firm.

Place:
Date:

Signature of the Authorized person of the Firm
with stamp and date

Appendix– D

(Bid Security)

Bank Guarantee Bond from any scheduled commercial bank of India

(On non-judicial stamp paper, which should be in the name of the Executing Bank).

Name of the Bank: -----

President of India Acting through

**The senior Divisional Electrical Engineer (Traction Distribution),
Southern Railway, Madurai Division.**

Beneficiary: **The Senior Divisional Finance Manager,
Southern Railway, Madurai Division,**

Date:

Bank Guarantee Bond No.:

Date: -----

In consideration of the President of India acting through **The senior Divisional Electrical Engineer (Traction Distribution), Southern Railway, Madurai Division, Madurai – 625 016**, (hereinafter called "The Railway") having invited the bid for _____

_____ through Notice inviting tender (NIT) No. _____, We have been informed that **[Insert name of the Bidder]** (hereinafter called "the Bidder") intends to submit its bid (hereinafter called "the Bid").

WHEREAS, the Bidder is required to furnish Bid Security for the sum of _____ **[Insert required Value of Bid Security]**, in the form of Bank Guarantee, according to conditions of Bid.

AND

WHEREAS, **[Insert Name of the Bank]**, with its Branch **[Insert Address]** having its Headquarters office at..... **[Insert Address]**, hereinafter called the **Bank**, acting through **[Insert Name and Designation of the authorised persons of the Bank]**, have, at the request of the Bidder, agreed to give guarantee for Bid Security as hereinafter contained, in favour of the Railway:

1. KNOW ALL MEN that by these present that I/We the undersigned **[Insert name(s) of authorized representatives of the Bank]**, being fully authorized to sign and incur obligations for and on behalf of the Bank, confirm that the Bank, hereby, unconditionally and irrevocably guarantee to pay to the Railway full amount in the sum of **[Insert required Value of Bid Security]** as above stated.
2. The Bank undertakes to immediately pay on presentation of demand by the Railway any amount up to and including aforementioned full amount without any demur, reservation or recourse. Any such demand made by the Railway on the Bank shall be final, conclusive and binding, absolute and

unequivocal on the Bank notwithstanding any disputes raised/ pending before any Court, Tribunal, Arbitration or any Authority or any threatened litigation by the Bidder or Bank.

3. The Bank shall pay the amount as demanded immediately on presentation of the demand by Railway without any reference to the Bidder and without the Railway being required to show grounds or give reasons for its demand of the amount so demanded.
4. The guarantee hereinbefore shall not be affected by any change in the constitution of the Bank or in the constitution of the Bidder.
5. The Bank agrees that no change, addition, modifications to the terms of the Bid document or to any documents, which have been or may be made between the Railway and the Bidder, will in any way absolve the Bank from the liability under this guarantee; and the Bank, hereby, waives any requirement for notice of any such change, addition or modification made by Railway at any time.
6. This guarantee will remain valid and effective from..... ***[insert date of issue]*** till ***[insert date, which should be minimum 90 days beyond the expiry of validity of Bid]***. Any demand in respect of this Guarantee should reach the Bank within the validity period of Bid Security.
7. The Bank Guarantee is unconditional and irrevocable.
8. The expressions Bank and Railway herein before used shall include their respective successors and assigns.
9. The Bank hereby undertakes not to revoke the guarantee during its currency, except with the previous consent in writing of the Railway. This guarantee is subject to the Uniform Rules for Demand Guarantees, ICC Publication No.758.
10. The Bank hereby confirms that it is on the SFMS (Structured Financial Messaging System) and shall invariably send the advice of this Bank Guarantee to the following bank details –

IFSC CODE	SBIN000RAIL
IFSC TYPE	BRANCH
BANK NAME	STATE BANK OF INDIA
BRANCH NAME	RAIL
CITY NAME	NAVI MUMBAI
ADDRESS	SECTOR-11, CBD BELAPUR, NAVI MUMBAI
DISTRICT	NAVI MUMBAI
STATE	MAHARASHTRA
BG ENABLED	YES

11. The Guarantee shall be valid in addition to and without prejudice to any other security Guarantee(s) of Bidder in favour of the Railway. The Bank, under this Guarantee, shall be deemed as Principal Debtor of the Railway.

Date

Place.....

.....

Bank's Seal and authorized signature(s)

[Name in Block letters]

[Designation with Code No.]

[P/Attorney] No.

Witness:

1 Signature, Name & Address & Seal

2 Signature, Name& address & Seal

Bank's Seal

[P/Attorney] No.

Note: All italicized text is for guidance on how to prepare this bank guarantee and shall be deleted from the final document.

Appendix – E - Tenderers Credentials

TENDERERS CREDENTIALS

Please Furnish the following Details:

- 1) (a) Details of your previous experience on installation of similar equipments

(b) Details of similar works presently under execution and their completion period
- 2) Have entered into technical collaboration with any consultants to assist you in this work? If so, give full particulars
- 3) (a) (i) Give details of technical personnel employed along with date of joining and the service with the tenderer.

(ii) Details of the personnel proposed to be engaged for this subject work

(a) List of plants, tools and equipments owned by the firm and proposed to be used on this work.
- 4) Give the names of principal manufacturers from whom supply is assured.
- 5) Give constitution of your firm. Attach certified copies of legal documents in support thereof.

NOTE: This form shall be filled precisely and with full details.

Appendix – F - Site Order Book

SOUTHERN RAILWAY

SITE ORDER BOOK

Name of Work:

AGT. No. / Date:

Name of the contractor.....

Starting date of construction:

Sl. No.	Site Order by Inspecting officials	Signature of the official	Noting Signature		Compliance details	Remarks	Compliance Signature	
			Contractor	SSE			Contractor	SSE

Notes:

1. For every work, separate site order book should be maintained.
2. Site order should be recorded specifically and chronologically.
3. Wherever required site orders may be supported by sketches.

Special Note:

Any objection of the contractor to the site order should be brought to the notice to the Executive Engineers or higher officials immediately by the contractor separately

Appendix – G - Hindrance Register

SOUTHERN RAILWAY

HINDRANCE REGISTER

Name of Work:

AGT. No. / Date:

Name of the contractor.....

Starting date of construction:

Sl. No.	Nature of hindrance	Date of Occurrence	Date of removal	Period of hindrance	Over lapping period	Total period of hindrance	Extension recommended	Extension approved	Clause under GCC	Signature	
										Contractor	SSE

Note : Separate register to be maintained for each work.

Appendix – H - Material Transaction Register

SOUTHERN RAILWAY

MATERIAL TRANSACTION REGISTER

Name of Work:

AGT. No. / Date:

Name of the contractor.....

Starting date of construction :

Location of Stores :

Date of Receipt	Name/ Nature of work	Opening Balance	Item Description	Details of Receipt				Total received (with unit)	Test Certificate	Signature		Details of issues			Closing Balance	Remarks regarding performance	Signature	
				Voucher No.	Brand	Quantity	Expiry Date			Contractor	SSE	Date	Quantity	Total issued			Contractor	SSE

Note : Separate register to be maintained for each work.

Appendix – I - Daily Progress & Labour Register

SOUTHERN RAILWAY

DAILY PROGRESS & LABOUR REGISTER

Name of Work:

AGT. No. / Date:

Name of the contractor.....

Starting date of construction:

Date	Status of work (in the beginning)	Progress (on date)	Contractor labour (available at site)	Remarks	Signature	
					Contractor	Rly Representative

Note : Separate register to be maintained for each work.

Appendix – J - Cube Testing Register

SOUTHERN RAILWAY

CUBE TESTING REGISTER

(Applicable for concreting work)

Name of Work:

AGT. No. / Date:

Name of the contractor.....

Starting date of construction:

Sl. No.	Date of concreting	Name of component	Grade of concrete	Compressive Strength in N/mm ²					Signature		Compressive Strength in N/mm ²					Remarks	Signature	
				Date of testing	After 7 days curing						Date of testing	After 28 days curing						
					I	II	III	Avg.	Contractor	SSE		I	II	III	Avg.		Contractor	SSE

Note : Separate register to be maintained for each work.

Appendix – K – Guaranteed Performance Technical And Other Particulars

SCHEDULE OF GUARANTEED PERFORMANCE TECHNICAL AND OTHER PARTICULARS

S.No.	Description	Unit
Appendix I: SHUNT CAPACITOR TECHNICAL DETAILS (FOR HT FILTERS ALSO)		
1.	Make and type (attach data sheet of manufacturer)	
2.	Governing standards	
3.	Location of capacitor bank (outdoor/indoor)	
4.	Rated system voltage	kV
5.	Rated voltage of capacitor unit	kV
6.	Maximum voltage the capacitor unit can withstand continuously	kV
7.	Rated frequency	Hz
8.	Upper limit of temperature category	°C
9.	Capacity of individual unit at its rated voltage	kVAR
10.	Rated current (continuous) of capacitor unit	A
11.	Maximum inrush current at the instant of switching	A
12.	Basic insulation level of capacitor unit a) Power frequency withstand voltage b) 1.2/50 micro-second impulse withstand voltage	kVrms kVp
13.	Basic insulation level of complete capacitor bank a) Power frequency withstand voltage b) 1.2/50 micro-second impulse withstand voltage	kVrms kVp
14.	Transient current withstand capacity of each unit	kA
15.	Constructional details of capacitor unit a) Dielectric material b) Foil material & thickness c) Impregnating liquid used and its properties	
16.	Total maximum loss at rated voltage and at frequency 50 Hz	W/kVAR
17.	Capacitor unit a) Number of elements in series b) Number of parallel paths c) Capacitance of each unit.	μF
18.	Capacitor bank a) Number of series groups b) Number of parallel units in each group c) Capacitance of the bank	μF
19.	Type of internal fuse element of capacitor unit	
20.	Attach time/current characteristics of the fuse element	
21.	Discharge device a) Type b) Location c) Time interval between de-energization and re-energization d) Residual voltage after 10 min of de-energization	s Min V
22.	Bushings a) Make and type	

	b) Wet-one minute power frequency withstand voltage c) Impulse withstand voltage 1.2/50 μ s full wave d) Creepage distance in air e) Number of bushings in each unit	kVrms kVp mm
23.	Overall dimensions a) Capacitor unit b) Complete capacitor bank	mm
24.	Weight per unit	kg
25.	Weight of the complete bank	kg
26.	Maximum loss in the complete capacitor bank at its normal operating voltage and current	W
27.	Temperature class/ Insulation class/ Protection class of the capacitor bank	
Appendix-II – SERIES REACTOR (FOR HT FILTERS ALSO)		
1.	Make and type (attach data sheet of manufacturer)	
2.	Governing standards	
3.	Rated system voltage	kV
4.	Rated frequency	Hz
5.	Inductance value and tolerance	mH (+/-%)
6.	Quality factor (XL/R) at 50 Hz and 75°C	(minimum)
7.	Type of reactor (type and core, cooling method, etc)	
8.	Rated current (fundamental), IN	A
9.	Rated voltage (fundamental), UN	V
10.	Continuous operating current, rms (including various harmonic currents)	A
11.	Core linearity (as a multiple of rated current IN)	
12.	Value of the peak surge voltage generated at the time of switching in of shunt capacitor	kVp
13.	Short circuit current rating for 3 seconds	kA
14.	a) Number of taps on the reactor b) Minimum inductance c) Maximum inductance	H H
15.	Basic insulation level of reactor c) Power frequency withstand voltage d) 1.2/50 micro-second impulse withstand voltage	kVrms kVp
16.	Overall dimensions of the reactor	mm
17.	Total weight of the reactor	kg
18.	Maximum loss in the reactor at its normal operating voltage and current	W
19.	Resonance frequency of the system, including shunt capacitor and series reactor (details of calculation should be enclosed with offer).	Hz
20.	Temperature class/ Insulation class/ Protection class of the reactor	
Appendix-III – CONTROL & RELAY PANEL		
1.	Name of manufacturer and address	

2.	Overall dimensions a) Length b) Width c) Height	mm
3.	a) Colour of the panel b) Colour of the mimic	
4.	Details of switches provided and their makes	
5.	Annunciations provided	
6.	Size of wires used for: a) Control circuit b) Indication circuit c) General wiring d) PT and CT circuits	mm ²
7.	Method of cable entry	
8.	Details of instruments provided	
Appendix-IV – PROTECTIVE RELAYS OF CAPACITOR BANK		
1.	<u>Instantaneous overcurrent relay</u> a) Type and make of relay b) Setting range available	
2.	<u>Overcurrent</u> a) Type and make of relay b) Setting range available	
3.	<u>Overvoltage protection</u> a) Type and make of relay b) Setting range available	
4.	<u>Unbalance Protection</u> a) Whether voltage operated or current operated relays are used. b) Setting range available c) Calculations to show that the number of capacitor units which when fail shall produce the rated over-voltage on other capacitor units and the setting range available in the relay offered suits the same shall be enclosed. d) How provision of alarm in the case of failure of one or two capacitor units has been achieved. e) Details (type and make and setting range) of the time delay relay. f) Calculations to show that co-ordination between the operation of individual fuses to isolate faulty units and unbalance protection exists should be appended.	
5.	The required capacity of current transformer and potential transformer in VA	
NOTE: The tender shall be complete with technical literature and pamphlets of the relays used.		
Appendix-V – PROTECTION OF 27.5 kV / 600 V or any other suitable voltage TRANSFORMER		
1.	The Firm/Vendor shall furnish details of protection proposed for the IGBTs.	
Appendix-VI – PROTECTION OF IGBT		

1.	The Firm/Vendor shall furnish details of protection proposed for the IGBTs.	
Appendix-VII – SURGE ARRESTORS		
1.	The Firm/Vendor shall furnish full technical particulars of the surge arrestors offered.	
Appendix-VIII: IGBT BASED VOLTAGE SOURCE CONVERTER PANEL		
IGBT Technical Details		
1.	Make and type (attach data sheet of manufacturer)	
2.	Governing standards	
3.	Collector-emitter voltage V_{CES}	V
4.	Gate-emitter voltage V_{GES}	V
5.	Continuous collector current at T_c of 25°C	A
6.	Continuous collector current at T_c of 80°C	A
7.	Junction operating temperature range T_j (min. and max.)	°C
8.	Collector-emitter saturation voltage $V_{CE(sat)}$	V
9.	Turn-on switching energy E_{on}	mJ
10.	Turn-off switching energy E_{off}	mJ
11.	Thermal resistance $R_{th(j-c)}$	K/W
12.	Attach data sheet of the IGBT of manufacturer	
DC Link Capacitor		
13.	Type and make (attach data sheet of manufacturer)	
14.	Governing standards	
15.	Capacitance value (and tolerance)	μF
16.	Rated voltage	V
17.	Rated current	A
18.	Dissipation factor $\tan \delta$ (Not more than 0.2% at 1 kHz and 25°C permitted)	
19.	Power loss in DC link capacitor	W
20.	Operating temperature at rated output	°C
21.	Operational life of DC link capacitor at 45 °C	h
22.	Attach ageing curve (operating temp. Vs life in hours)	
PWM Reactor		
23.	Make and type (attach data sheet of manufacturer)	
24.	Governing standards	
25.	Inductance value (and tolerance)	mH
26.	Rated voltage (fundamental)	V
27.	Rated current (fundamental)	A
28.	Switching frequency, f_s	kHz
29.	Continuous operating current, rms (including various harmonic currents)	A
30.	Type of core	

31.	Type of winding	
32.	Loss in the reactor at continuous operating current	W
Voltage Source Converter Panel Technical Details – IGBT Based		
33.	Continuous operating voltage	V
34.	Continuous operating current	A
35.	Rated output per panel	kVAR
36.	Conduction loss at rated output	W
37.	Switching frequency adopted	Hz
38.	Switching loss	W
39.	All other losses (like cooling load, diodes etc)	W
40.	Total power loss per panel at rated output	W
41.	Input ripple filter type (LC/LCL)	
42.	Noise level at 1 m distance from panel (Not more than 75 dB (A) permitted)	dB (A)
43.	Overall dimensions of the panel	mm x mm x mm
44.	Weight of each panel	kg
45.	Control of IGBTs: The Firm/Vendor shall furnish full technical particulars of the control equipment used for the control of IGBTs.	
Appendix-IX: 1-PHASE STEP-DOWN TRANSFORMER (27.5kV/600V OR 650V OR ANY OTHER SUITABLE VOLTAGE)		
1.	Standard governing specifications	
2.	Rated primary voltage	kV
3.	Rated secondary voltage(s)	V
4.	Rated output	MVA
5.	Rated impedance [MVA base is the rated MVA of the secondary winding] at 75°C.	% % %
	i) Primary to secondary winding-1 ii) Primary to secondary winding-2 iii) Secondary winding-1 to secondary winding-2	
6.	Type of cooling	
7.	Maximum temperature rise under normal operating conditions over an ambient of 45°C a) of oil by thermometer b) of winding by resistance	°C °C
8.	Iron loss at 50 Hz and 100% rated voltage (max)	W
9.	Copper loss at 75°C at rated load (max)	W
10.	Withstand time without injury with dead short-circuit at the terminals	s
11.	a) Type of core b) Flux density in the core at rated voltage and 50 Hz (Not more than 1.6 Tesla permitted)	Tesla
12.	Rated power frequency withstand voltage of windings a) Primary b) Secondary	kVrms kVrms

13.	Rated lightning impulse withstand voltage 1.2/50 μ s a) Primary b) Secondary	kVp kVp
14.	Off-circuit tap changer on primary winding a) Number of plus taps and minus taps b) Variation per tap in %	
15.	Overall dimensions of the assembled transformer	mm x mm x mm
16.	Weight of the assembled transformer	kg
17.	Noise level at 1 m distance from transformer (Not more than 75 dB (A) permitted)	dB (A)
18.	Insulation class of the transformer	

Appendix -X: HT PASSIVE FILTERS AT 25 kV WITH CAPACITOR AND SERIES REACTOR

S.No.	Description	Harmonic filter for			Unit
		3 rd	5 th	7 th	
1.	Value of capacitance (and tolerance)				μ F
2.	Value of inductance (and tolerance)				mH
3.	Value of capacitor reactance at the harmonic frequency, XC				ohm
4.	Value of reactance of series reactor at the harmonic frequency, XL				Ohm
5.	Series resonant frequency of the L-C combination				Hz
6.	Quality factor (XL/R) of series reactor at tuning frequency and 75°C				(minimum)
Capacitor ratings					
7.	Rated fundamental current				A
8.	Continuous operating current, rms (including harmonics)				A
9.	Rated fundamental voltage				V
10.	Continuous operating voltage, rms (including harmonics)				V
11.	Rated kVAR at fundamental frequency				kVAR
12.	Maximum kVAR with harmonics (continuous duty)				kVAR
Series reactor ratings					
13.	Rated fundamental current				A
14.	Continuous operating current, rms (including harmonics)				A
15.	Rated fundamental voltage				V
16.	Continuous operating voltage, rms (including harmonics)				V
17.	Rated kVAR at fundamental frequency				kVAR
18.	Maximum kVAR with harmonics (continuous duty)				kVAR
Operating parameters of the L-C filter at 25 kV bus voltage and 800A load current [Note: Consider typical load current harmonics as: 3rd = 19%, 5th = 10%, 7th = 8%, 9th = 4%]					
19.	Fundamental kVAR drawn by the L-C filter				kVAR

20.	Total kVAR drawn (including harmonics)				kVAR
21.	RMS voltage across capacitor				V
22.	RMS voltage across reactor				V
23.	RMS current through the filter				A
24.	THD of current (source) with filter				%
25.	THD of current (source) without filter				%
Other details					
26.	Furnish details of capacitor and reactor as in A and B above (refer page 29 and 30)				
27.	Detailed simulation results should be furnished along with the offer to support the data furnished above.				

Appendix – L – Benefit / Loss Information

BENEFIT/LOSS INFORMATION TO BE SUBMITTED BY THE VENDOR (in terms of Clause 14)

Before compensation (As given by railway) (1)	Maximum demand (kVA) (2)	>120 % upto 140 % (3)	>100% upto 120 % (4)	>80% upto 100 % (5)	>60% upto 80% (6)	>40% upto 60% (7)	>20% upto 40% (8)	≤20 % (9)	Total (10)
	Hours per day								
After compensation	MD in kVA								
	Average PF (kWh/kVAh)								
Analysis of power losses (in kW)	Shunt capacitor bank losses (+)								
	IGBT Panel losses (+)								
	Losses in HT Filters (+)								
	Other losses (specify details) (+)								
	Reduction in losses in substation transformer after compensation (-)								
	Net Loss L in kWh (+)								

NOTE: For each of the above, the mid value of the range should be taken for integration, for calculation of the benefit/loss. For example, for the range above 60% up to 80% the mid-value is 70%.

Appendix – M – Calculation of Capitalised Cost

Method For Calculation Of Capitalized Cost

Data for calculation of capitalized cost

Net loss “L” in kWh per day as per information furnished by Firm/ Vendor in **Appendix-L**

Cost of procurement, installation & commissioning of PQR including construction of covered area for housing indoor equipment as quoted by Firm/Vendor: Rs “P”

AMC charges per annum as quoted by Firm/Vendor: Rs “X_n” for nth year.

Period of capitalization assumed, N = 8 years [n = N*12 in months]

Discount rate, R = 0.07 per unit per annum [r = 7 / 1200 per unit per month]
assumed for calculation of net present value of benefits and costs.

Calculation of capitalized cost

If the monthly total saving due to reduction in fixed charges by reduction in MD, low power factor penalty charges, and harmonic surcharges arising of the installation of PQR is M, then the capitalized benefit B is given by:

$$B = \sum_{t=1}^n \left\{ \frac{M}{(1+r)^t} \right\} = \frac{M[(1+r)^n - 1]}{r(1+r)^n}$$

If the monthly cost in energy charges for net losses of L kWh/day is C_e, then the capitalized cost C₁ is given by:

$$C_1 = \sum_{t=1}^n \left\{ \frac{C_e}{(1+r)^t} \right\} = \frac{C_e[(1+r)^n - 1]}{r(1+r)^n}$$

The capitalized cost C₂ of AMC charges (for 5 years from 3rd year onwards) is given by:

$$C_2 = \frac{1}{(1+R)^x} \sum_{i=1}^{N-x} \left\{ \frac{X_i}{(1+R)^i} \right\} ; \text{ Where } x \text{ is the warranty period in years, } X_i \text{ is the AMC charge}$$

for ith year, and (N-x) is the AMC period in years.

Then the total capitalized cost C of power quality compensating equipment shall be given by:

$$C = P + C_1 + C_2 - B$$

Note: Reduction in Maximum Demand will be calculated as under:

Load power factor, $\cos \theta = 0.8$ lag (at metering point); I_R = Maximum reactive power injection by PQR in A; Load voltage at metering point, |V| = 27 kV;
Uncompensated load current, |I₁| = 800 A or as given in tender document.

Then, compensated current, $|I_2| = \sqrt{(|I_1| \cos \theta)^2 + (|I_1| \sin \theta - |I_R|)^2}$ A

Maximum Demand Reduction = |V|. |I₁| - |V|. |I₂| kVA

Hints for calculation Capitalized cost (C):

$$C = P + C_1 + C_2 - B$$

- i) Cost of procurement, installation & commissioning of PQR including construction of covered area for housing indoor equipment as quoted by Firm/Vendor: Rs “P”.

ii) Capitalized cost (C₁):

The **Capitalized cost (C₁)** is calculated by converting the **Ce** into a capitalized value in accordance with the methodology specified in the Appendix -M. Calculation method of Ce is furnished below,

$$C_e = L \times \text{No of days in month} \times (\text{Energy Charges/Unit})^\#$$

Where,

- Ce - Monthly cost in energy charges for net losses of L kWh/day, **where L is the net loss in kwh/day as furnished by the firm/vendor for each TSS as per Appendix-L format.**
- No of days in Month - Considered as 30 days.

[#] As per the provisions of **Para 3.1.3 of the Tamil Nadu Electricity Regulatory Commission Tariff Order for Distribution for FY 2025-26**, the applicable tariff for Railway Traction comprises:

- **Energy Charges: 775 paise per kWh (i.e., Rs.7.75 per unit)**

iii) Capitalized cost (C₂) :

The Capitalized cost C₂ of AMC charges (for 5 years from 3rd year onwards) is calculated based on the formula provided in the Appendix-M. Where,

- a) x = 3 (Warranty period)
- b) Xi = AMC charges furnished by the Firm/Vendor for ith year.
- c) N-x = 5 (AMC period in years)
- d) Period of capitalization assumed, N=8 years
- e) Discount rate, R=0.07 per unit per annum

iv) Capitalized benefit (B):

The **capitalized benefit (B)** is calculated by converting the **Monthly Total saving (M)** due to **reduction in fixed charges by reduction in MD, low power factor penalty charges and harmonics surcharges arising of the installation of PQR** into a capitalized value in accordance with the methodology specified in Appendix-M. Calculation method of Monthly Total saving (M) is furnished below,

Monthly Total saving (M) = **Monthly Savings due to reduction in MD + Monthly Savings in low Power factor penalty charges + Monthly Savings in Harmonics surcharge.**

a) Monthly savings due to reduction in MD:

Note: Reduction in Maximum Demand will be calculated as under:
Load power factor, $\cos \theta = 0.8$ lag (at metering point); I_R = Maximum reactive power injection by PQR in A; Load voltage at metering point, $|V| = 27$ kV;
Uncompensated load current, $|I_1| = 800$ A or as given in tender document.
Then, compensated current, $|I_2| = \sqrt{(|I_1| \cos \theta)^2 + (|I_1| \sin \theta - |I_R|)^2}$ A
Maximum Demand Reduction = $|V| \cdot |I_1| - |V| \cdot |I_2|$ kVA

b) Monthly Savings in low Power factor penalty charges:

Monthly Savings in Power factor charges = (Penalty Percentage imposed by TANGEDCO for Power Factor compensation charges)[^] × Number of Reduction of 0.01 in Average power factor from 0.90 × Monthly Current consumption charges.

Where,

Monthly current consumption charges = (Average monthly energy consumption of corresponding TSS (Kwh) × (Energy Charges in Rs/Unit)[#]) + (Average Recorded Maximum Demand × (Demand Charges in Rs. /KVA/month)[#])

[^] As per the **Para 3.1.1.6 of the Tamil Nadu Electricity Regulatory Commission Tariff Order for Distribution for FY 2025-26**, Low Power Factor compensation charges.

[#] As per the provisions of **Para 3.1.3 of the Tamil Nadu Electricity Regulatory Commission Tariff Order for Distribution for FY 2025-26**, the applicable tariff for Railway Traction comprises:

- Demand Charges: Rs. 608 per kVA per month
- Energy Charges: 775 paise per kWh (i.e., Rs.7.75 per unit)

Indicative data/details for Monthly Savings in low PF penalty charges calculations:

S.No	TSS Name	Average Monthly Energy consumption (KWh)	Average Recorded Maximum Demand	Average Power factor	Numbers of Reduction of 0.01 in Average power factor from 0.90.	(Penalty percentage of Power Factor compensation charges)^
1	<u>PLNI TSS</u>	387250	6049	0.74	16	2%
2	<u>GMGM TSS</u>	634688	9296	0.75	15	1.5%
3	<u>RMD TSS</u>	889876	7313	0.8	10	1.5%
4	<u>MNM TSS</u>	689892	6322	0.79	11	1.5%
5	<u>TENI TSS</u>	301627	4268	0.71	19	2%

Example calculation for Monthly savings in Power Factor charges:

For PLNI TSS:

Monthly current consumption charges = $(387250 * 7.75) + (6049 * 608) = 66,78,979.50$

Monthly savings in Power Factor charges = $(2/100) * 16 * 6678979.50 = \text{Rs. } 21,37,273.44/-$

C) Monthly Savings in Harmonics surcharges:

Monthly saving in Harmonic surcharges = Penalty Percentage imposed by TANGEDCO for Harmonics*
× Monthly Current consumption charges.

Where,

Monthly current consumption charges = $(\text{Average monthly energy consumption of corresponding TSS (Kwh)} \times (\text{Energy Charges in Rs/Unit})^{\#}) + (\text{Average Recorded Maximum Demand} \times (\text{Demand Charges in Rs. /KVA/month})^{\#})$

[#] As per the provisions of **Para 3.1.3 of the Tamil Nadu Electricity Regulatory Commission Tariff Order for Distribution for FY 2025-26**, the applicable tariff for Railway Traction comprises:

- Demand Charges: ₹608 per kVA per month
- Energy Charges: 775 paise per kWh (i.e., ₹7.75 per unit)

* As per revised TNEB Tariff (TAMIL NADU ELECTRICITY REGULATORY COMMISSION, CHENNAI, Amendments to the Tamil Nadu Electricity Supply Code (Notification No. TNERC/SC/7 – 47 dated 29.03.2022) (Lr. No. TNERC/Legal/1030/2022))

Indicative data/details for Monthly Savings in Harmonics surcharges calculations:

S.No	TSS Name	Average Monthly Energy consumption (KWh)	Average Recorded Maximum Demand	As per one week Harmonics Measured by the Railway, Highest value of TDD excess over and above the IEEE std limit	(Penalty percentage imposed by TANGEDCO for harmonics as per the Amendments to the Tamil Nadu Electricity Supply code)*
1	<u>PLNI TSS</u>	387250	6049	6%	2%
2	<u>GMGM TSS</u>	634688	9296	13.25%	5%
3	<u>RMD TSS</u>	889876	7313	2.3%	1%
4	<u>MNM TSS</u>	689892	6322	37.45%	10%
5	<u>TENI TSS</u>	301627	4268	2.98%	1%

Example Calculation for Monthly savings in Harmonics surcharges

For PLNI TSS:

Monthly current consumption charges = $(387250 * 7.75) + (6049 * 608) = 66,78,979.50$

Monthly savings in Harmonics surcharges = $(2/100) * 6678979.50 = \text{Rs. } 1,33,579.59/-$

Appendix – N– CAMC Maintenance / Repair Schedule and Details

ProForma for Details of Maintenance / Repair Schedule Items For CAMC

Schedule No:	<u>Details of Monthly / Quarterly / Half Yearly / Yearly Maintenance and Checks</u> <u>(Explanatory Note) :</u>
Item Description :	
Name of the TSS :	

Note :For each maintenance schedule Item, The details of maintenance / Repair schedule items shall be provided for each equipment as specified by the tenderer shall be provided as per the above proforma for each TSS in compliance with the RDSO specification

Appendix – O- Proforma For Quoting Rates for CAMC

PROFORMA FOR QUOTING RATES FOR CAMC

Rates for CAMC for PQR at PLNI, GMGM, MNM, RMD and TENI for Five Years

Name of the work: MDU Division – Provision of Power Quality Restorers for AC Traction Systems at the Traction Substations in Palani, Gomangalam, Manamadurai, Ramanathapuram and Teni

Tender Number: U-TRD-OT-26-27-IV-1

S. No	Sub-Station	Rate for Comprehensive Annual maintenance contract for power quality restorer					
		I st year	II nd year	III rd year	IV th year	V th year	Total
1	TSS at Palani						
2	TSS at Gomangalam						
3	TSS at Manamadurai						
4	TSS at Ramanathapuram						
5	TSS at TENI						
Total							

Note:

In order to ensure trouble free working after the warranty period, the CAMC will be awarded as part of this contract to the same Firm which executes the work for a period of 5 years from the date of expiry of the warranty period. Separate agreement will have to be executed in this regard before expiry of the warranty period of three years. The payment for each year towards CAMC is fixed and same will be paid quarterly after compliance as per CAMC agreement. It is mandatory for the tenderers to quote the rate for comprehensive maintenance for a period of five years after expiry of the warranty period. Though the rates quoted are binding, Railway reserves the right to enter into an agreement and proceed with the CAMC just before the expiry of the warranty period depending upon the prevailing situation at that point of time. **Since the CAMC cost forms part of the Capitalized Cost calculation of the PQR system, the tenderer shall quote and submit the CAMC cost for each TSS as part of the Financial Bid attachments. Failure to quote the CAMC cost for any TSS shall render the offer liable for summary rejection.**

Signature of the Contractor:

Seal:



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आज़ादी का
अमृत महोत्सव

भारत सरकार Government of India
रेल मंत्रालय Ministry of Railways
रेलवे बोर्ड (Railway Board)



सं.2021/Tele/5(2)/3-Part(1)(3425647)

नई दिल्ली, दिनांक: 12.06.2023

The GM/CMD/MD/PCAO/CAO,
All Indian Railways, KRCL, PUs, CORE, COFMOW
(As per standard list)

The DGs/Directors
RDSO, NAIR, All CTIs

Sub.: Procedure for undertaking digging work in the vicinity of Signalling, Electrical and Telecommunication cables

Ref.: JPO issued vide Board's letter No.2003/Tele/RCIL/1Pt.IX dated 24.06.2013 (Telecom Circular No.17/2013)

A Joint Procedure Order (JPO) for undertaking digging work in the vicinity of underground Signalling, Electrical and Telecommunication cables was issued last vide Board's letter No.2003/Tele/RCIL/1Pt.IX dated 24.06.2013 (Telecom Circular No.17/2013). Notwithstanding the provisions contained in the JPO for protection of cables, a significant number of cable-cut incidents and practical difficulties in implementation of certain provisions of the said JPO were reported.

Board, therefore, constituted a committee of SAG officers to revisit the JPO. Based on the recommendations of the committee, Board (MI) has approved broad guidelines for procedure to be adopted by Zonal Railways for protection of cables while undertaking digging work in their vicinity (**Annexure**). These guidelines are in supersession of JPO issued vide reference above.

Zonal Railways are requested to issue local instructions/guidelines/JPO implementing these broad guidelines within a month of issue of this letter. Zonal Railways may also ensure that these local instructions/guidelines/JPO are also made part of all tenders for works in the vicinity of cables in accordance with the instructions issued by Civil Engineering Dte of Railway Board vide letter No.2023/CE-I/EDCE(G)/Misc. Dated 18.04.2023.

DA: As above

(Signature)
12/6/23
(राकेश रंजन)

कार्यकारी निदेशक (दूरसंचार विकास)

दूरभाष: 011-47843012, 030-43012

ई.मेल: edtd@rb.railnet.gov.in

Copy to:

1. PSO to M(I) for kind information of Member/Infra
2. ED/SD, EDDE/M, EDCE/G, ED/GS/C-II for information & ensuring implementation of guidelines in letter & spirit
3. PCSTE, PCE & PCEE, All Indian Railways

कमरा सं.103-ए, रेल भवन, रायसीना रोड, नई दिल्ली - 110001

Annexure - I


Guidelines for protection of cables while doing work its vicinity

1. Cable route marking for all types of cable must be made available block section wise on Railnet.
2. Before allowing the contractor to work near the tracks, the work executing agency (like SrDSTE/SrDEN/SrDEE or DyCSTE/DyCEE/DyCE etc.) shall ensure that the permission has been granted by the division to the contractor in accordance with the local instructions / JPO to work in the vicinity of the cables. Zonal railways shall devise suitable mechanism and timelines for the obtaining/granting such permission.
3. In case of works being taken up by the State Government, National Highway Authority etc., zonal railways shall devise mechanism for shifting the cables or for proper protection of cables before granting permission to work.
4. The engineering control shall keep all the information regarding any works being done near the track. S&T and electrical control shall obtain this information from engineering control. These controls shall coordinate among themselves to ensure that no work is done in the vicinity of the track without proper permission.
5. The concerned SE/P.Way/SE/Works/SE/Sig/SE/Tele SE/Electrical (TRD or G) or RailTel supervisors supervising the work of the contractor shall ensure that the existing emergency sockets are not damaged due to their importance in providing communication during accident/emergency.
6. For all new works, cable shifting should be a mandatory part of DPR and estimate. For ongoing works, Zonal Railways may sanction works for cable shifting if necessary through contingency/supplementary/revised estimate where provision does not exist. However, in case zonal railways decide not to shift cables (due to any reason) then protection of cable shall be ensured by the zonal railways during execution of the work.
7. Penalty to be imposed for damages to cable shall be as under:

Cable damaged	Penalty per location
Only Quad cable or Signaling cable	₹ 1.0 Lakh
Only OFC	₹ 1.25 Lakh
Both OFC & Quad	₹ 1.5 Lakh
Electrical Cable	₹ 1.0 Lakh



8. Penalty should be levied on the contractor when they work without permission or resort to careless working without making arrangements for protecting cables and other utilities. Based upon the local conditions and practices, zonal railway shall devise its own conditions for examining and levying penalty. For each cable cut, a joint report at the level of supervisors should be prepared on the same day and it should become the basis for levying penalty and fixing responsibility. Joint note should be forwarded by SrDSTE/SrDEE to the executive in-charge of the work. The executive in-charge of the work should act and decide on the cable cut case within 15 days under information to SrDSTE/SrDEE as the case may be. There should be provision of appeal by contractors within one month of notice for levying penalty at ADRM level. Decision of ADRM shall be final and binding upon both parties.
9. Railways will not lodge FIR with RPF in cases of works being executed by authorized contractors of Railways who have been duly permitted to execute the works.
10. Zonal Railways shall issue local instructions/JPO for protection of cables while undertaking works in the vicinity of railway tracks in line with this guideline. Zonal Railways shall also ensure that such instructions become part of their tender document within one month of the issue of the local instructions. Suitable action against erring officials shall also be incorporated in these instructions if the same is not adhered to.



Annexure –VIB

Reference -Para 10.2 & 17.15.2 of Tender Form (Second Sheet) of Annexure I of ITT

Each Bidder or each member of a JV must fill in this form separately:**NAME OF BIDDER/JV PARTNER:**

Annual Contractual Turnover Data for the Previous 3/4 Years (Contractual Payment only)			
Year	Amount Currency	Exchange Rate	Indian National Rupees Equivalent
Average Annual Contractual Turnover for last 3 years			

1. The average annual contractual turnover shall be calculated as an average of “total contractual payments” in the previous three financial years. However, in case balance sheet of the previous year is yet to be prepared/ audited, the audited balance sheet of the fourth previous year shall be considered for calculating average annual contractual turnover.
2. The information supplied shall be substantiated by data in the audited balance sheets and profit and loss accounts for the relevant years in respect of the bidder or all members constituting the bidder.
3. Contents of this form should be certified by a Chartered Accountant duly supported by Audited Balance Sheet duly certified by the Chartered Accountant.

SEAL AND SIGNATURE OF THE BIDDER

Certified that all figures and facts submitted in this form have been furnished after full consideration of all observations/notes in Auditor's reports. _____

*(Signature of Chartered Accountant)***Name of CA:** _____**Registration No:** _____*(Seal)*

SCHEMATIC DIAGRAM

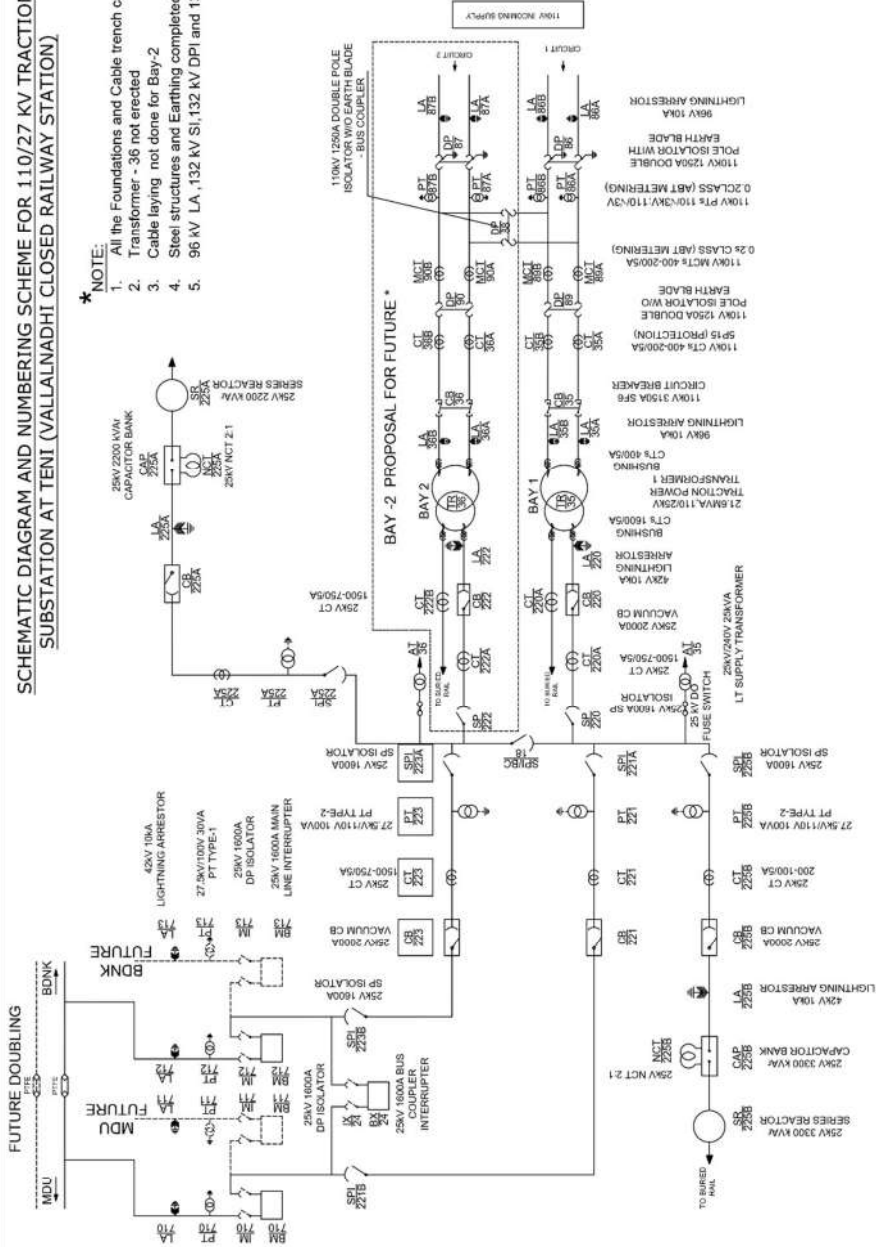
[illegible]

TENI/TSS SCHEMATIC DRAWING

SCHEMATIC DIAGRAM AND NUMBERING SCHEME FOR 110/27 KV TRACTION SUBSTATION AT TENI (VALLALNADHI CLOSED RAILWAY STATION)

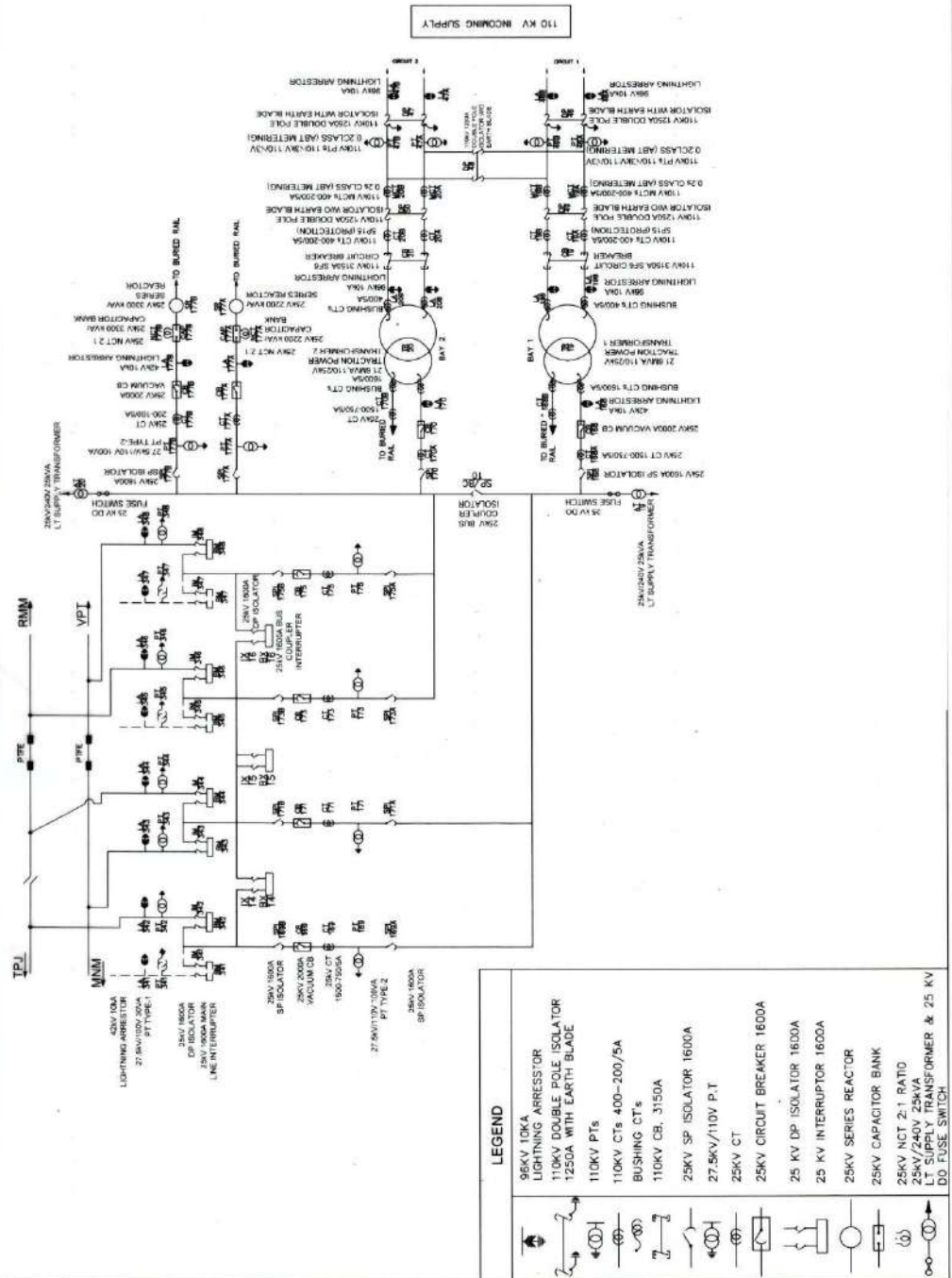
***NOTE:**

1. All the Foundations and Cable trench casted for Bay-2
2. Transformer - 36 not erected
3. Cable laying not done for Bay-2
4. Steel structures and Earthing completed for Bay-2.
5. 96 kV LA, 132 kV SI, 132 kV DPI and 132 kV CB, not erected.

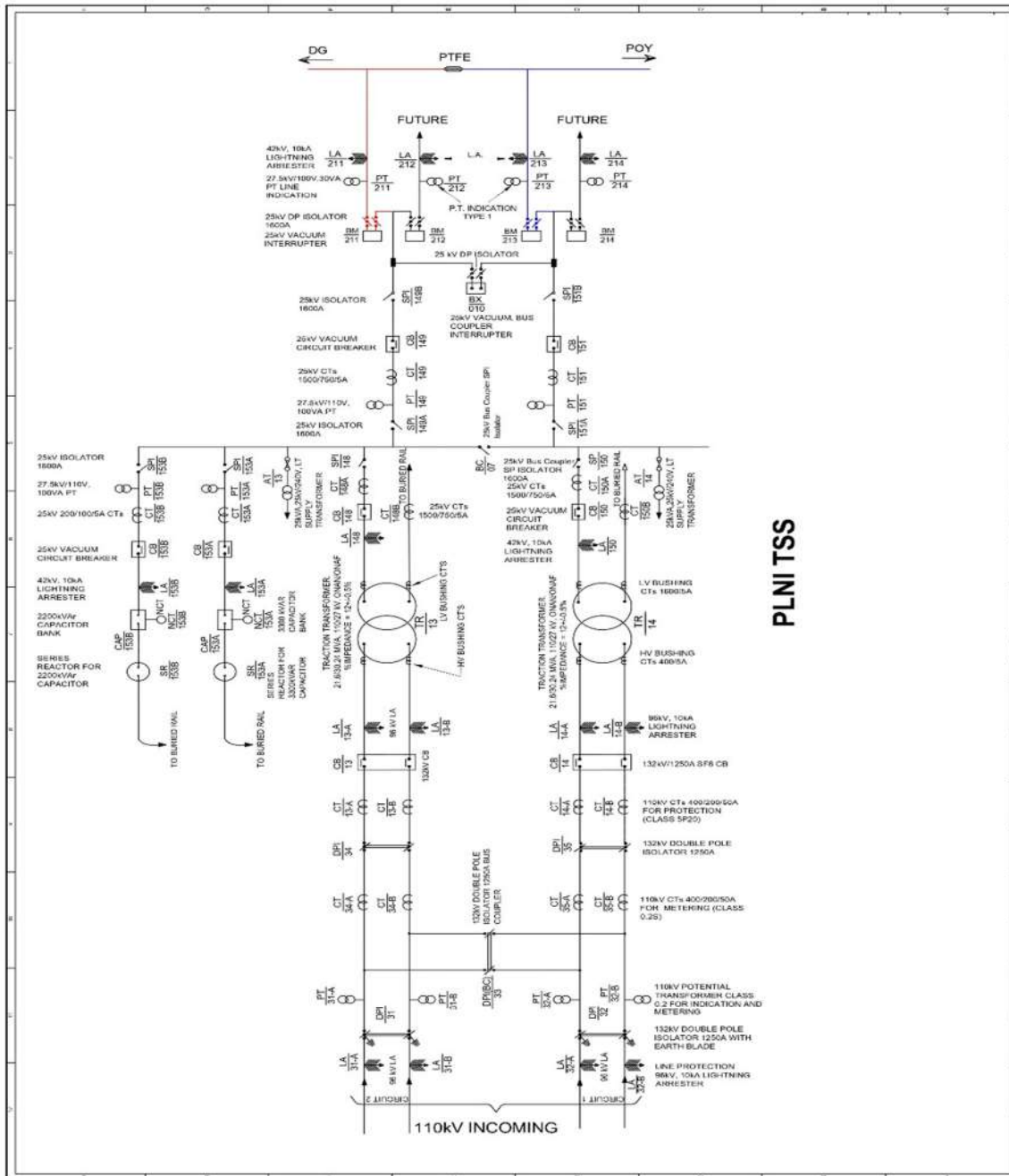


MNM/TSS SCHEMATIC DRAWING

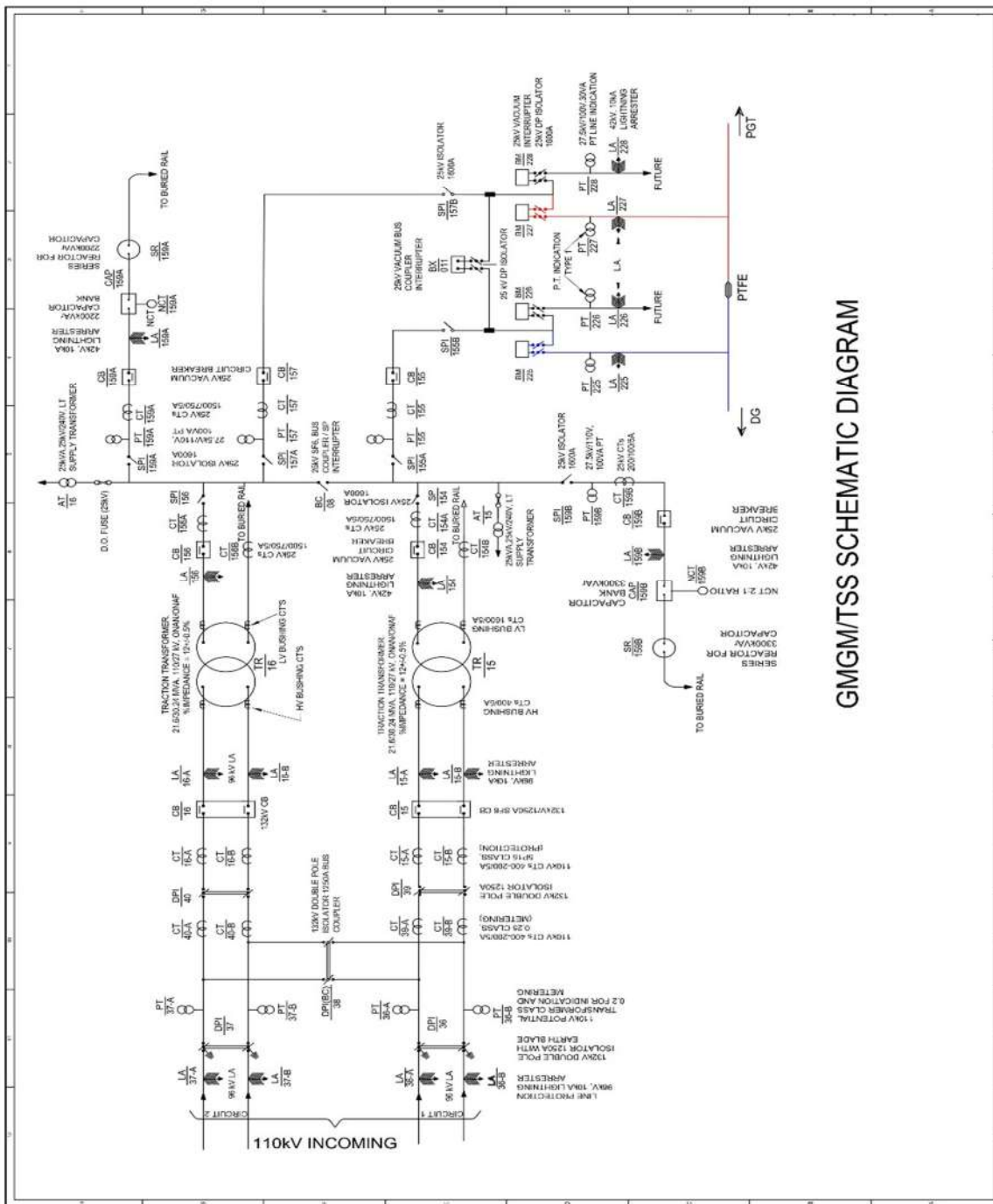
SCHEMATIC DIAGRAM AND NUMBERING SCHEME FOR 110/27 KV TRACTION SUBSTATION AT, MANAMADURAI



PLNI/TSS SCHEMATIC DRAWING



GMGM/TSS SCHEMATIC DRAWING



GMGM/TSS SCHEMATIC DIAGRAM

- End of Document -