GOVERNMENT OF INDIA
MINISTRY OF RAILWAYS
(RAILWAY BOARD)

2025/Proj./CMRL/D1/30/117 New Delhi, dated 22.05.2025

Managing Director,
Chennai Metro Rail Limited (CMRL)
No.327, Anna Salai, Nandanam,
Chennai-600 035, Tamil Nadu.

Sub: In-Principle Approval for 25 kV AC Traction Power Supply System and SCADA System (Annexure D1) of Corridor 3: 45.5 RKM (From Madhavaram to Siruseri including UG, EV & Ramp), Corridor 4: 26.1 RKM (From Poonamallee to Lighthouse including UG, EV & Ramp) and Corridor 5: 44.6 RKM (From Madhavaram to Sholinganallur including UG, EV & Ramp) of Phase -II Project of Chennai Metro Rail Limited (CMRL)

Ref: Annexure D-1 and related certificates & documents submitted by CMRL on RDSO's online portal dated 26.03.2025, 03.03.2025, 03.02.2025, 13.09.2024, 17.05.2024 & 01.02.2024

Chennai Metro Rail Limited (CMRL)'s request forIn-Principle Approval for 25 kV AC Traction Power Supply System and SCADA System (Annexure D1 – copy enclosed) of Corridor 3: 45.5 RKM (From Madhavaram to Siruseri including UG, EV & Ramp), Corridor 4: 26.1 RKM (From Poonamallee to Lighthouse including UG, EV & Ramp) and Corridor 5: 44.6 RKM (From Madhavaram to Sholinganallur including UG, EV & Ramp) of Phase -II Project of Chennai Metro Rail Limited (CMRL)has been examined in Board's office in consultation with RDSO and approval of the competent authority is hereby conveyed subject tosubmission of following documents by CMRL as per timeline committed by them:-

1. Submission of acceptance test report of proposed Neutral Section assembly for Phase II Project of CMRL by December, 2025.
2. Submission of FE Analysis of ROCS (tunnel) by May, 2025.
3. Submission of Factory acceptance test report of following equipment:
    a. 1250 KVA and 500 KVA auxiliary dry type transformers by December, 2026.
    b. 110 KV GIS, of Siruseri RSS and Butt Road RSS by December, 2025
    c. 110 KV GIS, for Thiruvanmiyur RSS and Nadhamuni RSS by April, 2026.
    d. 25 KV GIS, other than Poonamallee RSS/TSS &Perumbakkam RSS/TSS of Phase II Project of CMRL for corridor 3,4& 5 by August, 2026.
4. Submission of EIG Sanction for following corridors before Oscillation Trial –
    a. Corridor 3 = 45.5RKM (From Madhavaram to Siruseri including UG, EV & Ramp)
    b. Corridor 4 = 26.1RKM (From Poonamalleeto Lighthouse including UG, EV & Ramp)
    c. Corridor 5 = 44.6RKM (From Madhavaram to Sholinganallur including UG, EV & Ramp)

Contd.....2/

5. Submission of Onsite Software functionality tests and SCADA Integration test report for Corridor-3, Corridor-4 and Corridor-5 Project of CMRL' by December, 2027.
6. The following measures are suggested for implementation –
    a. Instead of standby DG set Battery storage power backup should be explored for emergency load
    b. Relay setting should be verified by independent agency.
    c. AI based condition monitoring of Overhead Catenary System should be explored.
    d. CMRL to ensure compliance of Cyber security guidelines issued by National Critical Information Infrastructure Protection Centre (NCIIPC) and Technical specification issued by RDSO for 25 kV single phase 50 Hz Traction Power Supply system.

Any dilution in the Stipulation/Compliances as submitted and detailed in Annexure-D1 suo moto by CMRL shall automatically invalidate the technical clearance.

Encl: as above

(Dr. Sanjeev Kumar Garg)
Executive Director/Gati Shakti/U&RRT
Railway Board
Ph: 011-47844368
Email: skg.irse@gov.in

Copy to:

(i) Executive Director/UTHS, RDSO, Manak Nagar, Lucknow w.r.t letter No. UT/CMRL/CMRL/P02/072023dated 07.04.2025

(ii) OSD/UT & Ex-Officio Joint Secretary, Ministry of Housing & Urban Affairs (MoHUA), NirmanBhavan, New Delhi-110011

(iii) ED/EEM, Railway Board

Annexure-1

25 kV AC Traction Power Supply System & SCADA System of Corridor 3: 45.5 RKM (From Madhavaram to Siruseri including UG, EV & Ramp), Corridor 4: 26.1 RKM (From Ponnamalle to Lighthouse including UG, EV & Ramp) and Corridor 5: 44.6 RKM (From Madhavaram to Sholinganallur including UG, EV & Ramp) of Phase -II Project of Chennai Metro Rail Limited, for the safety certification and technical clearance of the proposed metro system.			
S.N	SYSTEM	FEATURES	STANDARDS/ DRAWINGS
1.0	POWER SUPPLY: Incoming 110kV		
1.1	Receiving Substation (RSS)	110kV/27.5 kV AC	• Madhavaram RSS Overall SLD Drawing no. P2C35POH06RS1-LANT-PSSELEDWG-20101 • Nadhamuni RSS Overall SLD Drawing no. P2C35POH06RS3-LANT-PSSELEDWG-20301. • Thiruvanmiyur RSS Overall SLD Drawing no. P2C35POH06RS2-LANT-PSSELEDWG-20201. • Siruseri RSS Overall SLD Drawing no. P2C00POH08SIR-LINX-PSSDWG-00002 • Butt Road RSS Overall SLD Drawing no. P2C00POH08BUTT-LINX-PSSDWG-00002 • Perumbakkam RSS Overall SLD Drawing no. P2C00POH08PBM-LINX-PSSDWG-00002 • Alwarthiru Nagar RSS Overall SLD Drawing no. CON-P2C4-PRW-DR-PRW-20073-02, 03, 04 • Poonamallee RSS Overall SLD Drawing no. CON-P2C4-PRW-DR-PRW-20070-02, 03, 04
1.2	Earth Resistance at RSS	< 0.5 Ω	IEEE 80, IS 3043

Note: Any suo moto dilution in the stipulation/compliances as submitted by Chennai Metro Rail Limited for Phase II Project and detailed above shall automatically invalidate the technical clearance.

2.0	Traction Power Transformer at RSS	Madhavaram RSS, Nadhamuni RSS, Thiruvanmiyur RSS, Siruseri RSS, Butt Road RSS, Perumbakkam RSS, Alwarthiru Nagar RSS, Poonamallee RSS	IEC 60076, IS 2026, RDSO Spec no TI/SPC/PSI/30TRN/2070 or latest
	Capacity (02 nos. at each)	30/42 MVA	
	Single Phase/Three Phase	Single Phase Transformer	
	Vector Group	I.i	
	Number of taps & On Load Tap changing on HV side	16 Steps (+7 taps to -9 taps) & +9.55% to -12.27% in steps of 1.5%) on HV	
	Cooling Mode	ONAN/ONAF	
	Rated Power	30/42 MVA	
	Temperature Rise above ambient	Winding: 50°C Oil: 40°C	
	Overload Capacity	100 %: 5 Min 75 % : 10 Min 50 % : 20 Min 25 % : 1.0 Hour	
	Temp rise above ambient during Occasional Overload	Winding: 60°C Oil: 50°C	
	Operating Voltage	110/27.5 kV AC	
	Type	Outdoor	
	Noise Level at rated voltage & no load	Not more than 75 dB at 1.5 meter distance	
	Insulating Oil	Mineral Oil	IS 335:2018
3.0	Auxiliary Power Transformer	Madhavaram RSS, Nadhamuni RSS, Thiruvanmiyur RSS, Siruseri RSS, Butt Road RSS, Perumbakkam RSS, Alwarthiru Nagar RSS, Poonamallee RSS	IEC 60076
	Capacity (02 nos)	31.50/40 MVA	
	Single Phase/Three Phase	Three Phase	
	Vector Group	YNyn0	
	Number of taps & On Load Tap changing on HV side	15 Steps (+6 taps to -9 taps) & +10% to -15% to in steps of 1.667%) on HV and tap volt 1100	
	Cooling Mode	ONAN/ONAF	
	Rated Power	31.50/40 MVA	
	Temperature Rise above ambient	Winding: 55°C Oil: 50°C	
	Overload Capacity	100 %: 0.5 Hours 50 % : 1.0 Hours 25 % : 2.0 Hours 10 % : 4.0 Hours	

Note: Any suo moto dilution in the stipulation/compliances as submitted by Chennai Metro Rail Limited for Phase II Project and detailed above shall automatically invalidate the technical clearance.

	Temp rise above ambient during Occasional Overload	Winding: 75°C Oil: 65°C	
	Operating Voltage	110/33 kV AC	
	Type	Outdoor	
	Noise Level at rated voltage & no load	Not more than 71.62 dB at 1.5 meter distance	
4.0	Auxiliary Transformer	• 02 nos identical Dry Type Transformer • 33/0.433 kV (3 phase) • Rating: 200 KVA, 315 kVA, 500 KVA, 1250 kVA, 2000 kVA • Vector Group: Dyn11 • Cooling Mode: ONAN • Secondary Voltage: 433 V • Insulation Class (HV/LV): F/H • Type-Indoor	IEC 60076-11:2018
5.0	Gas Insulated Switchgear	• 3Ph, 110kV, 1500A, 50Hz, 31.50kA for 3sec, Indoor Gas Insulated Switchgear.	IEC 62271-1,100, 102, IEC 62271-203, IEC 61869-2,3, IEC 60694, IEC 60517, 60056
		• 3Ph, 33kV, 1250A, 50Hz, 25kA for 3 sec, Indoor Gas Insulated Switchgear	IEC 62271-1, 100, IEC 62271-102, 200, IEC 60694, IEC 61869-1,2,3, IEC 60044-1
		• 1Ph, 25kV, 2000A, 50Hz, 31.5kA for 3 sec, Indoor , Gas Insulated Switchgear	IEC 62271-1, 102, 200
6.0	Overhead Equipment Flexible OHE		
6.1	Aluminum Modular Cantilever Assembly	Bracket Tube • Outer Diameter: 70mm • Thickness: 6mm • Tensile Strength: 310 Mpa	Material: ALSi1MgMn , EN 573-3 Dimensional Tolerance: UNE-EN 755-9-2016 Chemical composition: UNE-EN 573-3-2020 Mechanical properties: UNE-EN 755-2-2016
		Stay Tube & Register Tube • Outer Diameter: 55mm • Thickness: 6mm • Tensile Strength: 310 Mpa	Material: ALSi1MgMn , EN 573-3 Dimensional Tolerance: UNE-EN 755-9-2016 Chemical composition: UNE-EN 573-3-2020 Mechanical properties: UNE-EN 755-2-2016
6.2	Span Length (max.)	54 mm (max.)	
7.0	Messenger Wire (Catenary Wire)	• 65 mm2 Cu-Cd • Diameter : 10.50 mm • Strands : 19	RDSO's latest revised specification No. TI/SPC/OHE/CAT (Cu-Cd)/0971

Note: Any suo moto dilution in the stipulation/compliances as submitted by Chennai Metro Rail Limited for Phase II Project and detailed above shall automatically invalidate the technical clearance.

		• Diameter of each Strand : 2.10±0.02 mm.	
8.0	Contact Wire	AC-150 mm^2 , Hard Drawn Grooved Copper (Diameter: 14.8 mm) Drawn out of 23 mm Continuous Cast Copper Wire Rod.	RDSO's latest revised specification No. TI/SPC/OHE/CW/0971 and EN 50149
9.0	Rigid Over Catenary System (ROCS)	Conductor Rail Details: • Material : Al alloy 6101B T6 (8WL 7230-0A) • Max. : Cross section Area (Al): 2300 mm^2 • Short Circuit Current : 45 KA for 100 ms • Resistivity (20 °C) : 0.029 Ω mm^2/m - 0.03333 Ω mm^2/m • Coefficient of Thermal Expansion: $23.4x10^{-6}/K$ • Length of Conductor as per drawing : 10 meter • Weight: 6.22 kg/m	EN AW 6101B T6, EN 573-3 , EN 755-2/9 DWG NO: C.6253-03-J4211-A002-P-31/108
10.0	Neutral Section	• Air Gap Type SNS • Speed for which NS Suitable: 120 kmph	Drawing no CON-P2C4-PRW-DR-PRW-20170-01-Rev.A
11.0	Tension in OHE		
11.1	Catenary Wire	1200 kgf	-
11.2	Contact Wire	1200 kgf	-
12.0	Jumper	• In Span, Turnout, G-Jumper, Potential Equalizing & Anti-theft Jumper - 95 mm2 • Material: Cu-ETP • Nominal Diameter: 14.70 mm	• DIN 43138
13.0	Dropper	• Current Carrying dropper • Material: Cu-Mg • Cross section Area- 12mm2 • Diameter -5mm • Dropper Contact wire Assembly	• NFC-34-110-2
14.0	Automatic Tensioning Device	• 3 Pulley Type ATD • Minimum Breaking Load: 120 kN • Maximum working Load: 26 kN	• RDSO's latest revised specification No. TI/SPC/OHE/ATD/0060 • Drawing no: TI/DRG/OHE/ATD/RDSO/00001/99/2
15.0	Power Cable (33 kV): 1Cx 400 sq mm 1Cx 240 sq mm 1Cx 95 sq mm	• 33 kV Cable • Single core, Cu/XLPE/FR-LSH PVC Power Cable • Conductor Screen Material - Extruded Semi Conducting Compound • Insulation Screen Material (Non-metallic): Extruded Semi conducting	IEC 60502-2, IEC 60332-1, IEC 60332-3

Note: Any suo moto dilution in the stipulation/compliances as submitted by Chennai Metro Rail Limited for Phase II Project and detailed above shall automatically invalidate the technical clearance.

Project Directorate Approved on 23/5/25 Railway Board

		Compound • Nominal Screen Material (Metallic): Plain copper wires with open helix copper tape • Outer Sheath Material: Extruded FR-LSH PVC Type ST II Black colour	
	Power Cable (33 kV): 1Cx 400 sq mm 1Cx 240 sq mm 1Cx 95 sq mm	• 33 kV Cable • Single core, Cu/XLPE/FR-LSZH PVC Power Cable • Conductor Screen Material - Extruded Semi Conducting Compound • Insulation Screen Material (Non-metallic): Extruded Semi conducting Compound • Nominal Screen Material (Metallic): Plain copper wires with open helix copper tape • Outer Sheath Material: Extruded FR-LSZH Compound Black colour	IEC 60502-2, IEC 60502-1, IEC 60332-1, IEC 60332-3
	Power Cable (25 kV): 1Cx 400 sq mm 1Cx 240 sq mm	• 25 kV Cable • Single core, Cu/XLPE/FR-LSH PVC Power Cable • Conductor Screen Material - Extruded Semi Conducting Material • Insulation Screen : Extruded Semi conducting Compound • Nominal Screen Material (Metallic & Non-Metallic): Plain copper wires and open helix copper tape • Outer Sheath Material: Extruded FR-LSH PVC Type ST II Black colour	IEC 60502-2, IEC 60228, IEC 60840, IEC 60332-1,3
	Power Cable (25 kV): 1Cx 400 sq mm	• 25 kV Cable • Single core, Cu/XLPE/FR-LSZH PVC Power Cable • Conductor Screen Material - Extruded Semi Conducting Material • Insulation Screen : Extruded Semi conducting Compound • Nominal Screen Material (Metallic & non-Metallic): Plain copper wires and open helix copper tape • Outer Sheath Material: Extruded FR-LSZH PVC Type ST II Black colour	IEC 60502-2, IEC 60502-1, IEC 60228, IEC 60840, IEC 60332-1, 3
16.0	Insulators	• Porcelain Insulators	• Section Insulator • Light Weight Section Insulator type 8WL5545-4AC

Note: Any suo moto dilution in the stipulation/compliances as submitted by Chennai Metro Rail Limited for Phase II Project and detailed above shall automatically invalidate the technical clearance.

		• Silicone Composite Insulators	• 9-Tonne Insulator: RDSO Specification no. TI/SPC/OHE/ INSCOM/1071 (with latest revisions) • Stay & Bracket Insulator: RDSO Specification no. TI/SPC/OHE/ INSCOM/1071 (with latest revisions) • Support Insulator for ROCS: RDSO Specification no. TI/SPC/OHE/ INSCOM/1071 (with latest revisions) • Operating Rod Insulator : RDSO Specification no. TI/SPC/OHE/ INSCOM/1071 (with latest revisions) • Post Insulator : RDSO Specification no. TI/SPC/OHE/ INSCOM/1071 (with latest revisions)
17.0	SCADA	i. Interfaces to control facilities at OCC, BCC ii. Dedicated HMI maintenance terminals iii. Head-end servers and databases iv. Remote Terminal Units (RTU) v. Remote Input / Output (I/O) Units vi. Data communications between all of the above	IEC 61850, IEC 60870-5-104
18.0	Control, Relay & Protection System	1. Traction Power Transformer Feeder at RSS: a. Transformer differential Protection b. Tank Protection c. Overcurrent Protection d. Under Voltage and Overvoltage Protection e. Earth Fault Protection f. Breaker Failure Protection 2. 33 kV Feeder Protection (Incoming Protection): a. Overcurrent Protection b. Overcurrent to ground Protection c. Breaker Failure Protection d. Under Voltage Protection e. Over Voltage Protection	IEC 60255, IEC 61850, IEEE C37.2:2008

Project Directorate Approved on 22/5/25 Railway Board

Note: Any suo moto dilution in the stipulation/compliances as submitted by Chennai Metro Rail Limited for Phase II Project and detailed above shall automatically invalidate the technical clearance.

		3. 33 kV Feeder Protection (Outgoing Protection): a. Overcurrent Protection b. Overcurrent to ground Protection c. Breaker Failure Protection d. Cable differential Protection 4. 25 kV Feeder Protection (Outgoing Line): a. Distance Protection Relay b. IDMT and DMT Over current protection c. Under Voltage and Over voltage Protection d. Emergency Current Protection e. Breaker Failure Protection f. WPC and PFR g. Automatic Reclosure h. Trip circuit Supervision i. Delta I Protection 5. 110/25 kV Feeder Protection (Incomer): a. IDMT Over current protection b. DMT Over current protection c. Overloading function d. Directional Power Protection e. Breaker Failure Protection f. Voltage protection g. Trip Circuit Supervision 6. Auxiliary Power Transformer Feeder at RSS: a. Transformer differential Protection b. Overcurrent protection c. Earth fault protection d. HV and LV REF Protection e. Standby Earth Fault Protection f. Under Voltage and Overvoltage Protection 7. 110 kV and 33kV Bus-Bar Protection: a. Bus-bar differential Protection 8. Protection in Auxiliary Substation: a. Overcurrent protection b. Overcurrent to Ground Protection c. REF Protection d. Breaker Failure Protection 9. 110 kV Incomer Feeder: a. Line differential Protection b. Distance Protection Relay	

Note: Any suo moto dilution in the stipulation/compliances as submitted by Chennai Metro Rail Limited for Phase II Project and detailed above shall automatically invalidate the technical clearance.

		c. Overcurrent protection 10. 110 kV Bus coupler Feeder: e. Overcurrent protection f. Earth Fault protection g. Under Voltage Protection h. Overvoltage Protection i. Breaker Failure Protection 11. 33 kV Bus Coupler Protection: a. Overcurrent protection b. Overcurrent to Ground Protection c. Breaker Failure Protection	
19.0	Aerial Earth Wire/Buried Earth Conductor	• Aluminium Conductor Steel Reinforced (ACSR Conductor) • 7 Steel Wire & 12 Aluminum Wires • Cross-section Area: 93.3 mm2 • Overall Dia. of Conductor: 12.5 mm • Diameter of each wire;: 2.5 ± 0.03 mm	IS 398 Part-II
20.0	Earthing	• Resistance earth Electrodes shall not exceed 10 Ω • Combine earth resistance : < 0.5 Ω	IS- 3043, IEEE 80 (with latest revision), EN 50122-1, EN 50122-2
21.0	Height of Contact Wire	Minimum Height from Rail level to underside of live conductor wire- • Under bridges & in tunnel.....4800 mm) • In the open.....5000 mm • At level crossing.....5500mm • In Running and carriage sheds wherever the staffs are expected to work on the roof of Rolling Stock .....5200 mm	Railway Board's approved SOD (Standard Gauge) for Chennai Metro Rail Ltd.
22.0	Electrical Clearances for At-Grade sections Elevated Sections	• Long Duration (Static) : 320 mm • Short Duration (dynamic) : 270 mm	Railway Board's approved SOD (Standard Gauge) for Chennai Metro Rail Ltd.

Project Directorate Approved on 23/5/25 Railway Board

Note: Any suo moto dilution in the stipulation/compliances as submitted by Chennai Metro Rail Limited for Phase II Project and detailed above shall automatically invalidate the technical clearance.

File No. 2025/Proj./CMRL/D1/30/117 (Computer No. 3494254)
Generated from eOffice by AVINASH, JD/PROJECT(A), JD/PROJECT, Project Directorate on 23/05/2025 11:21 am