GOVERNMENT OF INDIA
MINISTRY OF RAILWAYS
(RAILWAY BOARD)

2024/Proj./BMRCL/PH-II/D1-D2/30/85 New Delhi, dated 22 .07.2024

Managing Director,
Bangalore Metro Rail Corporation Limited (BMRCL),
3rd Floor, BMTC Complex
K.H. Road, Shanthinagar,
Bangalore - 560027

Sub: In-Principle Approval for 750 V DC Traction & Power Supply and SCADA System as per Annexure D2 for Reach 5 Corridor of Bangalore Metro Rail Phase II Project i.e. RV Road Station to Bommasandra Station- (Ch: -599.086 m to Ch: 18086.074 m)- 18.82 km, (includes 01 Depot at Baiyapanahalli and 02 nos. RSS at Silk Route & Hebbagodi) of Bangalore Metro Rail Corporation Limited (BMRCL).

Ref: Annexure D-2 and related certificates & documents submitted by BMRCL on RDSO's online portal dated 05.05.2024, 06.03.2024 & 9.10.2023

Bangalore Metro Rail Corporation Limited (BMRCL)'s request for In-Principle Approval of 750 V DC Traction & Power Supply and SCADA System as per Annexure D2 (copy enclosed) for Reach 5 Corridor of Bangalore Metro Rail Phase II Project i.e. RV Road Station to Bommasandra Station- (Ch: -599.086 m to Ch: 18086.074 m)- 18.82 km, (includes 01 Depot at Baiyapanahalli and 02 nos. RSS at Silk Route & Hebbagodi) of Bangalore Metro Rail Corporation Limited (BMRCL) has been examined in Board's office in consultation with RDSO and approval of the competent authority is hereby conveyed subject to the following conditions:-

1) BMRCL shall submit Final EIG Sanction of the Metro Rail Sections of Reach- 5 Project from chainage Ch: -599.086 (Buffer End of RV Road Station) to Ch: + 18086.074 (at Bomasandra Station) and 02 nos. RSS at Silk Board & Hebbagodi including 01 Depot at Baiyappanahalli, before oscillation trial.

2) BMRCL to ensure, the Clearances for Power line crossings including Telephone line crossings of Railway Tracks, in Territory of 750 VDC Traction & Power Supply System of BMRCL, as per Para-11 of Chapter-1 of IRSOD- 2022 with latest A&C slips issued by Railway Board.

3) BMRCL shall submit SCADA System Integration and commissioning Test Report and certificate along with onsite Software level Functionality Test Reports before issue of Interim Speed Certificate.

Contd.....2/

4) BMRCL shall regularly monitor the performance of Traction & Power Supply Equipment for at least two years from the commencement of the commercial operation of proposed Section of Reach-5 Project and submit the two year performance certificate of the following equipment to RDSO-

a) Mid-Point Anchor Assembly,
b) Expansion Joints Assembly,
c) Bracket Support Assembly,
d) Conductor Rail,
e) Splice Joint assembly for Third rail,
f) Expansion Joint,
g) Anchor Assembly,
h) Insulated Joint assembly,
i) Power Feed Assembly,
j) Ramp,
k) Protective Covers (UPVC cover, GRP cover and SMC cover).
l) 20 KVA UPS System,
m) SM 6F armored Optical Fiber Cable,
n) 630 sq mm Cu cable,
o) 20/25 MVA Power Transformer,
p) Lightning arrestor

Any dilution in the Stipulation/Compliances as submitted and detailed in Annexure- D2 suo moto by NAMMA Metro of Bangalore Metro Rail Corporation Limited shall automatically invalidate the technical clearance.

Encl: as above

22.7.24

(**F. A. Ahmad**)
Director/Gati Shakti (Civil)-IV
Railway Board
Ph: 011-47845480
Email: dirgsc4@gmail.com

Copy to:

(i) **Executive Director/UTHS**, RDSO, Manak Nagar, Lucknow w.r.t letter No. UTHS/24/BMRCL/Elect. dated 18.06.2024

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

(iii)**ED/EEM**, Railway Board

Annexure-1

Traction & Power Supply System (3rd Rail Bottom Current Collection-750 V DC) of "Reach 5 Project of BMRCL"

S. N.	System	Features		Standards/Drawings
1.0	POWER SUPPLY: Incoming 220 kV & 66 kV			
1.1	Receiving Substation (RSS)	220 kV/33kV (AC) (Silk Board)		DRG No. 019044-E-IS-SY-EL-5008 DRG No. 019044-E-IS-SY-1L-5001 DRG No. 019044-E-IS-CB-EL-5009
		66 kV/33 kV (AC) (Hebbagodi)		DRG No. 019044-E-IS-SY-EL-3008 DRG No. 019044-E-IS-SY-1L-3001 DRG No. 019044-E-IS-CB-EL-3009
1.2	Earth Resistance at RSS	< 0.5 Ω		IEEE-80, IS 3043
2.0	Power Transformer at RSS	Hebbagodi	Silk Board	
	Capacity	20/25 MVA (2 Nos)	50 MVA (2 Nos)	IEC-60076 IEC-60076-7
	Single Phase /Three Phase	Three Phase	Three Phase	
	Vector Group	Dyn5	YNyn0	
	Number of Taps & On Load Tap Changing on HV side	15 Steps, 16 Positions (+6, -10) & +10% to -16.67% in steps of 1.667%	16 Steps, 17 Positions (+6, -9) & +10% to -15% in steps of 1.667%	
	Cooling Mode:	ONAN/ONAF	ONAN	
	Rated Power	20/25 MVA	50 MVA	
	Temperature Rise above ambient	Oil : 50 ° C Winding : 55 ° C	Oil : 50 ° C Winding : 55 ° C	
	Overload Capacity	25 % : 4 Hrs 50% : 9 Min 100% : 3.6 Min	25 % : 3.5 Hrs 50% : 7.8 Min 100% : 2.9 Min	
	Temp rise above ambient during Occasional OverLoad.	Oil: 70 ° C Winding : 95° C	Oil: 70 ° C Winding : 95° C	
	Operating Voltage	66KV /33 KV	220KV /33 KV	
	Type	Out Door	Out Door	
2.1	Transformer Oil	Mineral	Mineral	IS 335
2.2	Noise Level-Transformer	Not more than 70 dB.	Not more than 70 dB.	
3.0	Traction Sub-Station (TSS)	33KV (AC)/585-585(AC)/750V DC		
3.1	Earth Resistance at TSS	< 1.0 Ω		IS 3043, IEEE-80
4.0	Rectifier Traction Transformer	• Cast Resin Dry Type Transformer • Capacity:2850 KVA (2 Nos) • One Primary & Two		IEC 60076-11, IS 2026-11 EN50329 Class VI

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		Secondary • Vector Group: Dd0y5 • Cooling Mode: AN • Overload Capacity: (a) 50% for 2 Hours (b) 300% for 1 minute • Tap Changer: ± 7.5% by Off Circuit tap links • Insulation Class: (HV/LV1/LV2): F/H/H • Type: Indoor	
5.0	Auxiliary Sub-station (ASS)	33 KV/415 V	
5.1	Earth Resistance of ASS	< 1.0 Ω	IS 3043, IEEE-80
6.0	Auxiliary Transformer	• Cast Resin Dry Type Transformer • Capacity: 500 KVA,1000KVA & 2000 KVA • 33 KV/0.415KV, 3 phase • Vector Group: Dyn11 • Cooling Mode: AN • Tap Changer:±5% by Off Circuit tap links • Insulation Class: (HV/LV): F/H • Type: Indoor	IEC 60076-11
7.0	Gas Insulated Switchgear	3ø, 50 Hz, 220kV,1250 A, 50kA for 1 Sec, Indoor SF6 Gas Insulated Switchgear	IEC: 62271-1, IEC 62271-203, IEC 61869-1,2,3
	Air Insulated Switchgear	3ø, 50 Hz, 33kV,1250 A, 25kA for 1 Sec, Indoor Air Insulated Switchgear	IEC: 62271-100, IEC 62271-200, IEC 61850 ,IEC 61869-1,2
8.0	750 V DC Traction System (Bottom Current Collection)		
8.1	Conductor Rail (Third Rail)	Steel & Aluminium (Co-Extruded)	As per Design Aspects of Bangalore Metro Rail Corporation Limited.
8.2	Nominal Current at 45° C ambient (without exceeding 45°C heat rise)	4500 A DC	
8.3	Nominal Voltage	750 V DC	
8.4	Designed voltage	1000 V DC	
8.5	Transient Voltage	3000 V DC	
8.6	Max. Electrical Resistance at 20° C	6.35 μΩ/meter	
8.7	Maximum Heat Rise at an Ambient Temp. of 40° C	45° C	
8.8	Short Circuit Level (1 Second)	50 kA	
8.9	Linear mass	17.2 kg/meter	
8.10	Thickness of Stainless Steel Strip	6.0 mm	
8.11	Chromium Content in Stainless Steel Grip.	Chromium , Cr: 16 to 18 %	
9.0	Cables	• 630 Sq.mm, 1R, 1C, 66KV, Cu Cable, XLPE insulated, Lead sheathed, Copper Wire Screened, HDPE Outer Sheathed Power Cable, over all	IEC 60502-2, IEC-60840, IEC 60228,

		Graphite Coated. • Conductor & Insulation Screen Material – Extruded Semi Conducting Compound.	
		• 1000 Sq.mm, 1R, 1C, 220KV, Cu Cable, XLPE insulated, Lead sheathed, Copper Wire screened, HDPE Outer Sheathed Power Cable, over all Graphite Coated. • Conductor & Insulation Screen Material – Extruded Semiconducting Compound.	IEC 60502-2, IEC 62067, IEC 60228
		• 400 Sq.mm,1R X1C, XLPE (Cu),33KV, FRLS /FRLS0H, Power Cable. • Conductor Screen Material – Extruded Semi Conducting Compound. • Insulation Screen Material – Extruded Bonded Type Semiconducting Compound.	IEC 60502-2, IEC-60332-1, IEC-60332-3, IEC 60228
		• 240 Sq.mm, 1RX1C, XLPE (Cu), 33KV, FRLS /FRLS0H, Power Cable. • Conductor Screen Material – Extruded Semi Conducting Compound. • Insulation Screen Material – Extruded Bonded Type Semiconducting Compound.	IEC 60502-2, IEC-60332-1, IEC-60332-3, IEC 60228
		• 300 Sq.mm, 1 C, XLPE, Copper (Cu), • Voltage Grade: 1.8/3 KV, DC Cable. • Conductor: CU/XLPE • Armour: H4 Grade Al. Round wire. • Outer Sheath: FRLS / FRLS 0H PVC – Type ST-2 • Colour: Black	IEC 60502-2, IEC-60332-1, IEC-60332-3, IEC 60228
10.0	Insulator	• Bulk mounding Compound Insulator	As per Design aspects of Bangalore Metro Rail Corporation Limited.
10.1	Creepage Distance	• 159.1 mm	
10.2	Fume index	• ≤ 20 (F1 Classification)	
10.3	Impact Resistance(Min)	• 400 J/ m (Minimum)	
10.4	Deflection Temperature	• 80 ° C at 1.82 N/mm2	
10.5	Water Absorption	• 0.3 % (Max) in 24 hrs at 23 ° C	
10.6	Dielectric Strength	• 10 KV/mm	
10.7	Flame Spread Index	• 15 (Max)	
11.0	Horizontal & Vertical Clearances of Third Rail	As per BMRCL's SOD approved by Railway Board	
12.0	Stray Current Mitigation System	Stray current Monitoring System (SCMS) is implemented	EN -50122-2 (Latest)
13.0	Control Relay Panel &	220 KV:	IEC 61850, IEC 60870, IEC

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	Switchgears Protection	1. 220 KV incomer 1&2 FDR 2. 220 KV Trfr -1 & 2 FDR 3. 220 KV B/C FDR 4. 220 KV Bus Bar Protection	61000, IEC 62439
		66 KV: 1. 66 KV incomer 1&2 FDR 2. 66 KV Trfr -1 & 2 FDR 3. 66 KV B/C FDR 4. 66 KV Bus Bar Protection	
		1. 33 KV Ring FDR 2. 33 KV Traction Trfr FDR 3. 33 KV Auxiliary Trfr FDR 4. 33 KV B/C FDR	
		High Speed Switchgear	IEC 61850, IEC 60870-104, IEC 50123, IEC 61992-2
14.0	SCADA	• In SCADA System: a. RTU is provided with redundant Ethernet Switches at Stations and RSS. b. Redundant communication Link Between RTU and TER Network for communication to OCC/BCC Servers. c. Redundant Communication Server, Application Server, Data base Server at OCC & BCC. d. Redundant communication Link Between TER Network to SCADA Servers. e. Time Synchronization over NTP protocol via Ports provided by Telecom Operator (TER) f. Data Transfer Protocol as per IEC 60870-5-104. g. Network Protocol between RTU and Relays/IED's/OVPD as per IEC 61850. h. Protocol Between RTU and EM/MFM/Temp Scanner through MODBUS. i. Data Speed -100 mbps	IEC 60970-5, IEC 60780-5-104 Master, IEC 60780-5-104 Slave, IEC 61850 IEEE 802.3
		Battery: Capacity — 182 AH — 300 AH Material — Ni.cd — Ni. cd No. of Cell — 85 — 85	IEC 62259, IEC 60623, IS 10918

			Electrolyte	KOH Solution	KOH Solution	
			Approx. Cell weight	11.00 Kg	18.70 Kg	
		UPS: 2 X 20 KVA ,415 V AC INPUT,240 V AC OUTPUT, 50 Hz.				IEC 62040-3
		Battery Charger: Thyristor based, 119 V/50 A Duel Float Cum Boost Charger.				IEC 60146,IS IS 4540, IS-2026,IS-3895, IS 1248
		SCADA software				As per Design aspect of Bangalore Metro Rail Corporation Limited.

Note:- Any dilution in the Stipulation/Compliances as submitted and detailed above suo moto by NAMMA Metro of Bangalore Metro Rail Corporation Limited shall automatically invalidate the technical clearance.

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22/7/2024
Railway Board