

**GOVERNMENT OF INDIA  
MINISTRY OF RAILWAYS  
(RAILWAY BOARD)**

No.2024/Proj./MPMRCL/E1-E2/30/101

New Delhi, dtd. 24.12.2024

**Managing Director,**

Madhya Pradesh Metro Rail Corporation Ltd.,  
2nd Floor, Smart City Dev. Corporation Building,  
Kalibadi Road, BHEL, Sector-A, Berkheda,  
Bhopal-462022.

**Sub:- In principle approval for adopting CBTC Technology for Signalling and Train control System - Bhopal & Indore Metro Rail Project of Madhya Pradesh Metro Rail Corporation Limited (MPMRCL).**

**Ref:** (i) RDSO letter no. UTHS/MPMRCL dated 02.12.2024  
(ii) MPMRCL documents submitted through Online Portal

The Signaling & Telecommunications system architecture & sub system details, submitted by MPMRCL for Bhopal (Orange line, Blue line) & Indore (Yellow or Ring line) Metro Rail Projects have been evaluated in consultation with RDSO and approval of the competent authority for the same is hereby conveyed as under:

**A. Signalling systems:**

SN	Description	Minimum Requirement	Proposed equipment & reference submitted by MPMRCL
1.	Type of Signalling	Cab Signalling, CATC (ATP, ATO, ATS). ATP and ATS are essential, ATO is optional.	<p>CBTC system including CATC (ATP, ATO &amp; ATS) using 5.8 GHz ISM Band of M/s Alstom make U400 REG Baseline ver. 2.14.3.10 has been planned for Bhopal and Indore Metro.</p> <p>MPMRCL has mentioned that this is same Generic system on U400 platform using 5.8 GHz ISM band manufactured and supplied by M/s Alstom which is deployed in following projects:</p> <ul style="list-style-type: none"><li>i. Thomson East Coast Line Stage-1 Project in revenue since 31st January 2020 (ver.2.13.10.2). User Certificates of Thomson-East Coast Line Stage-1 Project issued by Land Transport Authority (LTA) Singapore dated 19-05-2020 have been submitted.</li><li>ii. Pune Metro/MML-2/7 in revenue since April 2022.</li></ul>
2.	Back up Signalling	Line side (CLS) at entry and exit at all interlocked stations.	LED base Signal-Main Aspect as per RDSO specification RDSO/SPN/199/2010 (Rev-01) LED based signal, Shunt aspect and LED based Route Indicator as per RDSO specification RDSO/SPN/153/2011 (Rev 4.1).

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3.	Interlocking	EI with built-in block working facilities.	<p>The Computer Based Interlocking (CBI) of M/s Alstom's make, U400 REG - CBI Sub-system baseline 14.3.2 has been planned.</p> <p>SIL-4 safety ISA Certificate &amp; ISA report dated 31-01-2024 issued by Bureau Veritas has been submitted and certified for integration within U400 REG baseline 2.14.3.10.</p>
4.	Train control system	CATC (ATP, ATS, ATO optional)	<p>CATC (ATP, ATO and ATS) has been planned</p> <ul style="list-style-type: none"> <li>• <b>CBTC</b> - M/s Alstom make U400 REG Baseline ver. 2.14.3.10 for train operation, control and protection has been planned.</li> </ul> <p>SIL-4 safety ISA Certificate &amp; ISA report dated 11-03-2024 issued by Bureau Veritas have been submitted and certified for integration of ATC baseline 14.6.2.2 and CBI baseline 14.3.2.</p> <ul style="list-style-type: none"> <li>• <b>ATC</b> – U400 ATC Sub-system baseline 14.6.2.2 has been planned.</li> </ul> <p>SIL-4 safety ISA Certificate dated 11-03-2024 &amp; ISA report dated 07-03-2024 issued by Bureau Veritas has been submitted.</p> <ul style="list-style-type: none"> <li>• <b>ATO</b> - ATO is covered under ISA Reports of ATC.</li> <li>• <b>ATS</b> – 'ICC CT ATS U400 FW release 1.3.1' has been planned.</li> </ul> <p>SIL-2 safety ISA Certificate &amp; ISA report dated 24-05-2022 issued by Bureau Veritas have been submitted.</p>
5.	Type of Track Circuits	Coded Audio Frequency Track Circuits (AFTC)	<p>The primary train detection is performed by using Radio based system working on 5.8GHz. The radio based system is integral part of the CBTC system &amp; secondary (fall back) detection is based on digital axle counter system of M/s Frauscher make Model: FAdC R2 with AEB101-GS05.</p> <ul style="list-style-type: none"> <li>• SIL-4 safety Supplementary Assessment Report dated 15.10.2021 and Inspection Certificate dated 15-10-2021 issued by M/s TUV has been submitted.</li> </ul>

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6.	Point machine		
	i) For Main Line	i) Non-Trailable high thrust, high performance point machine	M/s Alstom Point machine. model: EEA-5, Non-Trailable high thrust, high performance point machine of IP-67 rating Motor shall be used. MPMRCL has mentioned that the similar point machine is in revenue operation in Delhi Metro Line-5/6 & 7.
	ii) For Depot	ii) Trailable high thrust, high performance point machine	SIL-4 safety ISA report dated 28.07.2023 & ISA Certificate dated 25.11.2024 issued by The Railway Research Institute IK (Instytut Kolejnictwa), Warsaw, has been submitted.
7.	Redundancy in cab equipment for ATP (Cab Sig.)	1+1(hot standby)	Non-Trailable type M/s Crompton Greaves (CG), as per IRS S-24.  Will be single electronic structure based on reactive fail safety with diverse software with duplicated hot standby configuration (Head/Tail redundancy)

#### B. Telecommunication systems

SN	Description	Minimum Requirement	Proposed equipment & reference submitted by MPMRCL
1.	Tele communication	Integrated system with OFC. Train Radio, CCTV, Centralized clocks, PA system, with the additional provision that Train Display Boards at stations should also be integrated in the system. Regarding Train Radio system, it should be fully digital and duplex system, the standards may be chosen based on techno-economic considerations.	<ul style="list-style-type: none"> <li>• Fiber Optic Transmission System (FOTS-IP)</li> <li>• Public Address System (PAS)</li> <li>• Passenger Information System (PIDS)</li> <li>• Time Distribution System (TDS)</li> <li>• Telephone System</li> <li>• Radio (TETRA) System</li> <li>• Closed Circuit Television (CCTV)</li> <li>• Emergency Help Point System (EHPS)</li> <li>• Voice Recording System (VRS)</li> <li>• Uninterruptable Power Supply (UPS) System</li> <li>• Video Transmission System (VTS)</li> <li>• Office Administration and IT (OA/IT)</li> <li>• Fault Reporting System (FRS)</li> <li>• Access Control &amp; Intrusion Detection System, (ACIDS)</li> </ul>
2.	Positive Train Identification	Provided with interface between ATS and Train Radio	Through CBTC Radio



C. The above approval is subjected to compliance of following stipulations before opening the line for passenger operation/revenue service:

- i. Before opening of the line for passenger operation/revenue service, complete assessment report and certification by ISA for achievement of required levels of safety as per latest CENELEC standards wherever applicable for train operation in MPMRCL for complete signalling & train control System including all subsystems shall be submitted to RDSO.
- ii. Preliminary & Final system hazard analysis and acceptance of its mitigation by MRA shall be submitted to RDSO as well as to CMRS and any hazards which require manual intervention/special instruction shall be suitably framed, incorporated and implemented by Metro authorities.
- iii. Documents as per Annexure E1 of "Procedure for Safety Certification and Technical Clearance of Metro Systems" including EMC/EMI report related to rolling stock shall be submitted to RDSO considering all mission-critical frequencies.
- iv. MPMRCL shall carry out rigorous testing of all mode of interference (both out of band and in band interferences) to prove non-susceptibility of 5.8 GHz band used for CBTC application to any kind of interference and shall align the access points for better reliability & test report shall be submitted to RDSO.
- v. The details of authorities responsible for maintenance of signalling system to the required level of safety during train operation shall be submitted to RDSO.
- vi. Details/Documents/Compliance related to arrangements made by MPMRCL to prevent risk of cyber threats to signalling, train controls and communication system/sub-systems shall be submitted to RDSO before the start of revenue operations.
- vii. MPMRCL has submitted that the development process of ATS is SIL 2, and all potentially unsafe effects of safety related functions performed by ATS and ATO shall be mitigated by mandatory interaction with SIL 4 subsystems (ATP and CBI) however dependency of operating authorities on VDU display units to run the trains during failure situations shall require a minimum level of SIL2 for VDU. If the same level of certification is not achieved, manual running of trains during signal failure condition shall not be done relying only upon the indication by ATS & suitable instructions regarding this shall be framed and strictly implemented.
- viii. Proposed system for Bhopal & Indore Metro Rail projects is with Grade of Automation "GoA2" i.e. STO (Semi Automatic): Train start & Stop - Automatic, Door operation & Handling emergencies - Manual. MPMRCL shall require to submit fresh application with details/documents of PSD system along with ISA safety certification etc. at the time of upgradation to UTO with PSD system.
- ix. Since the third rail traction of 750 V DC is being used, the signalling installations, point machines and other installations, which are imperatively connected to the running rails, must be insulated against the structure earth and earth to avoid stray currents as per respective standards. Also, proper earthing & bonding should be ensured as per respective standards.
- x. M/s TUV India Pvt Ltd (which is provisionally approved as per RDSO approved ISA panel for Metro Signalling Project), has been appointed as ISA of Bhopal & Indore Metro Project of MPMRCL and can take up assessment work for maximum four Metro projects/products. MPMRCL shall ensure this.



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- xi. As per TUV Nord System's letter dtd.16.12.2022 to RDSO, TUV Nord System GmbH & Co. KG, Germany will provide technical support to TUV India Pvt. Ltd. for the execution of Independent Safety Assessment of Metro line. All safety assessments, certificates and audit of safety aspects of the Signalling & Train control systems to be assessed, reviewed and approved by TUV India Pvt. Ltd. along with TUV NORD Systems, Germany.

Documents finalized duly signed by MRA as indicated vide item (i) to (xi) para 'C' above shall be submitted to RDSO & item (ii) to CMRS **as per annexure E1** before the start of revenue operations. Further, fulfillment of the "minimum requirement" described vide Annexure E1 and Annexure E2 of Metros as per "Procedure for Safety Certification and Technical Clearance of Metro Systems" shall also be ensured.

  
(Sanjeev Kumar Garg)  
Executive Director/U&RRT  
Railway Board  
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Copy to:

1. **Executive Director/UTHS**, RDSO, Manak Nagar, Lucknow w.r.t letter No. UTHS/MPMRCL dated 02.12.2024
2. **PED/S&T**, RDSO, Manak Nagar, Lucknow
3. **OSD/UT & Ex-Officio Joint Secretary**, Ministry of Housing & Urban Affairs (MoHUA), NirmanBhavan, New Delhi-110011
4. **Additional Member/Signal**, Railway Board