

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

2023/Proj./MMRCL/CBTC/30/43

New Delhi, dated 27.12.2023

Managing Director,
Mumbai Metro Rail Corporation Limited,
Transit Office 'E'-Block, North side of City Park,
Behind Income Tax Office 'A' Wing Bandra (E) BKC,
Mumbai 400051 (Maharashtra)

Sub:- In-Principle approval for adopting CBTC Technology for Signalling and Train control System & technical approval of Platform Screen Gates (PSG)- Mumbai Metro Line 3 Project.

Ref: (i) RDSO ltr.no. UTHS/MMRCL/MMRCL/P01 dated 25.7.2023
(ii)MMRCL uploaded document on RDSO's online portal on 22.06.2023, 22.05.2023, 16.02.2023, 10.01.2023, 05.12.2022, 24.08.2022

The Signaling & Telecommunications system architecture & sub system as submitted by MMRCL for Mumbai Metro Line No. 3 project 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
1.	Type of Signaling	Cab Signaling, CATC (ATP, ATO, ATS). ATP and ATS are essential, ATO is optional.	<p>CBTC system including CATC (ATP, ATO/UTO & ATS) using 5.8GHz ISM band of M/s Alstom make, UEVOL system version 1.11.2.6-2 has been planned. MMRCL mentioned that this is same Generic system based on URBALIS-400 platform, manufactured and supplied by M/s Alstom is already deployed in the following projects:</p> <ul style="list-style-type: none">i. Kochi Metro project since 2017ii. Sao Paulo Line 1,2 & 3 in Brazil since 2013iii. Malaga since 2013iv. Milano L1 Since 2010v. Shanghai L10 in China since April 2010vi. Beijing Line 2 Signalling system since June 2008vii. Beijing Airport Link, in service since July 2008viii. Lucknow Metro since March 2019 <p>MMRCL submitted user certificates of (i)Taichung Green Line (Taiwan) dated 07.04.22 for "Communication Based Automatic Train Control system with ALSTOM U-400 ATC and (ii)North West Line (Sydney) dated 21.12.2020 for URBALIS CBTC.</p> <ul style="list-style-type: none">• For MMLCL line no.3, the proposed Main CBTC System version 1.11.2.6 is an upgraded version of the generic baseline system ver.1.11.2.5 which is already approved for Mumbai Metro line no. 2 & 7.

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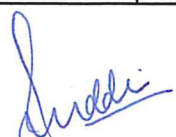
SN	Description	Minimum Requirement	Proposed equipment & reference submitted
2.	Back up Signalling	Line side (CLS) at entry and exit at all interlocked stations.	For Colour Light Signals RDSO/SPN/153/2011 Rev 4.1 specification is followed.
3.	Interlocking	EI with built-in block working facilities	<p>The Computer Based Interlocking (CBI) of M/s Alstom's make, UEVOL CBI Sub-system version 8.3.1 (based on SML400 BS platform and Smart I/O) is proposed.</p> <p>SIL 4 Certificate for UEVOL CBI Subsystem version 8.3.1, issued by M/s Arthur D Little (Certificate Reference Alstom/P19000730/022cer dated 19.07.2019) and ISA Report by Arthur D Little for CBI subsystem version 8.3.1 dated 19.07.2019 has been submitted.</p>
4.	Train Control system	CATC (ATP, ATS, ATO optional)	<p>CATC (ATP, ATO/UTO & ATS) has been planned.</p> <p>(i) CBTC - M/s Alstom make UEVOL system version 1.11.2.6-2 has been planned. The ISA certificate for UEVOL System ver. 1.11.2.6-2 (Certificate Reference: Alstom/P20001408/018cer issue 01, dated 23.11.20 & ISA report for SIL4 compliance by M/s Arthur D little has been submitted.</p> <p>(ii) ATC - UEVOL ATC Subsystem version 11.4.5.2 has been planned. ISA certificate for UEVOL ATC Subsystem version 11.4.5.2 (Certificate Reference: Alstom/P20001408/015cer, dtd 18.11.2020 & ISA report for SIL-4 by M/s Arthur D little has been submitted.</p> <p>(iii) ATS - ICC CT ATS U400 FW release 1.2.1 has been planned which is Software SIL2 compliant as per Safety assessment report issued by M/s Bureau Veritas (Reference: IND.ATS40/OR023/21 Rev 2 dated 27th May 2021) submitted.</p> <p>(iv) ATO - ISA certificate for UEVOL ATO Sub System version 11.4.9 (Certificate Reference: Alstom/P20001408/016 cer, dated 18.11.2020) has been submitted.</p> <p>(v) As mentioned by MMRCL that the first stage of commissioning will provide for ATP & ATO mode of operation.</p> <p>(vi) The second stage of commissioning will provide for UTO (GoA4) mode of operation over the complete line except the workshop / maintenance area. The UTO functions planned by MMRCL are attached as Annexure "A", subject to the stipulations mentioned below.</p>

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SN	Description	Minimum Requirement	Proposed equipment & reference submitted
5.	Type of Track Circuits	Coded Audio Frequency Track Circuits (AFTC)	<p>(i) 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 & secondary (fall back) detection is based on digital axle counter system of M/s Frauscher make Model: ACS 2000.</p> <p>(ii) SIL 4 certificate of M/s Frauscher Sensortechnik GmbH, Austria (model ACS 2000) Axle counting system issued by Dr. Graband & Partner, safety assessor accredited by the German Federal Railway Authority (Certificate Assessment no. 87U/3/13, dated 28.08.2013) has been submitted.</p>
6.	Point Machine		
	i) For Main Line	i) Non-Trailable high thrust, high performance point machine	Vossloh Cogifer make, model: MCEM 91, Non-Trailable high thrust, high performance point machine shall be used. The same point machine is in revenue operation in Delhi Metro Line-8.
	ii) For Depot	ii) Trailable high thrust, high performance point machine	Non-Trailable type Vossloh Cogifer make, As per IRS S-24.
7.	Redundancy in cab equipment for ATP (Cab Sig.)	1+1(hot standby)	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
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.	<p>(i) Fiber Optic Transmission System (FOTS)</p> <p>(ii) Public Address System (PAS)</p> <p>(iii) Passenger Information System (PIDS)</p> <p>(iv) Time Distribution System (TDS)</p> <p>(v) Telephone System</p> <p>(vi) Radio (TETRA) System</p> <p>(vii) Closed Circuit Television (CCTV)</p> <p>(viii) Voice Recording System (VRS)</p>
2.	Positive Train Identification	Provided with interface between ATS and Train Radio	Through CBTC Radio.



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C. Platform Screen Door:

SN	Description	Minimum Requirement	Proposed equipment & reference submitted
1	PSD system	General details	<p>PSD proposed is of M/s FANGDA Intelligent Innovation Technology Co Ltd. make. MMRCL mentioned that the underground stations will be installed with full-height platform screen door system (PSD) of 2150 mm height and at-grade station will be installed with half-height platform edge door system (PED) of 1500 mm height. In the generic certificate provided by Fangda, APG (Automatic Platform gate) corresponds to PED.</p> <p>(i) SIL-2 Certificate for Platform Screen Door issued by M/s Bureau Veritas Italia, Italy (Certificate No. X95P1901701 dated 30.05.2020) and ISA report for Platform Screen Door issued by M/s Bureau Veritas Italia, Italy (No.TLE/N-19/017-PSD/ASR01 dated 30.05.2020) has been submitted.</p> <p>(ii) SIL-2 Certificate for Automatic Platform Gate issued by M/s Bureau Veritas Italia, Italy (Certificate No. X95P1901702 dated 30.05.2020) and ISA report for Automatic Platform Gate (APG) issued by M/s Bureau Veritas Italia, Italy (No.TLE/N-19/017-APG/ASR01 dated 30.05.2020) has been submitted.</p>

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 safety assessment report and certification by ISA, for achievement of required levels of safety as per latest CENLEC standards wherever applicable for train operation in Mumbai Metro Line 3 project for complete signaling & train control System including all subsystems and platform screen door system, shall be ensured and a copy of same shall be submitted to RDSO.
- ii. The 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 & PSD shall be submitted to RDSO considering all mission-critical frequencies.
- iv. Mumbai Metro Line 3 project shall carry out rigorous testing of all mode of interference (both out of band and in band interferences) to prove non-susceptibility of 5.8GHz 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.

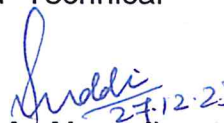


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- vi. In case of UTO the reliability & resiliency (ability to automatically restore i.e. fast re-routing the communication) is another critical consideration of the entire communication network, wireless as well as wired, so that the system should not fail. Similarly provisions must be made for dependable communication between OCC and passenger (in case of train stopping due to unusual incidence/ failures in tunnels to prevent them from panicking). **The details of final communication arrangement made compatible for UTO may be submitted to RDSO before start of operation in UTO mode.**
- vii. For **UTO mode of operation** (GoA 4), signalling system is capable of operating the trains without driver but the issue is the compatibility of infrastructure, i.e. stations, tunnels and trains for driver less operation, especially the perceived security aspects and emergency procedures. **Till these issues and procedures are compiled / prepared the train operation can't be done without driver. MMRCL shall submit the details / documents / compliance to RDSO related to compatibility of infrastructures, security aspects and emergency procedures before start of operation in UTO mode.**
- viii. Details /documents/ compliance related to arrangements made by MMRCL for Mumbai Metro Line 3 project to prevent risk of Cyber threats to Signalling and communication System/subsystems shall be submitted to RDSO before the start of revenue operations.
- ix. Mumbai Metro Line 3 has submitted that the 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. 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.
- x. Earthing and bonding shall be implemented and ensured by the MRA before start of operation.
- xi. M/s Bureau Veritas Italia S.p.A (which is on RDSO's approved ISA panel for Metro Signalling Project), has been appointed as ISA of Mumbai Metro Line 3 signalling system of MMRCL.

Documents finalized duly signed by MRA as indicated in item (i) to (x) tabulated 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.

Encl: As above


(F. A. Ahmad)
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Copy to:

1. **Executive Director**, RDSO, Manak Nagar, Lucknow-226011 w.r.t letter No. UTHS/MMRCL/MMRCL/P01 dated 25.07.2023
2. **OSD/UT & Ex-Officio Joint Secretary**, Ministry of Housing & Urban Affairs (MoHUA), Nirman Bhawan, New Delhi-110001
3. **ED/GS/S&T**, Railway Board

Annexure A

SN	Description of special UTO functionalities s mentioned by the MRA	How the functionalities are performed/achieved	Exact role of Signalling to execute the functionalities
1	Evacuation: There are three types of Evacuations: a) Planned Evacuation in Stations b) Planned Evacuation in-between Stations c) Unplanned Evacuation	For Evacuation, please refer section 9.3 and 9.4 of document Final System (UTO) Operating Data (STPT-GCC-DOC-002177-R07)	Detrainment door opening is triggered by Train operator or passenger when there is a need of evacuation. This trigger (opening of latch and rotation of lever managed by Rolling Stock) acts as a request to Traffic controller for approval. This request is transmitted to OCC by Signalling system. If request is approved Signalling system, it passes this approval to TCMS for opening of Detrainment door. It is to be noted that this request/authorisation shall work only when evacuation is triggered and other conditions for evacuation are already fulfilled eg zone has been secured for evacuation, train is at stop etc. An untimely request/ trigger for opening of detrainment door will be generate alarm at OCC
2	Jog Function: Shall determine whether train is "Short docked" or "Long docked".	For Jog function, please refer section 13.2 of document Final System (UTO) Operating Data (STPT-GCC-DOC-002177-R07)	A GAMA Zone is an area where operation in UTO/ATO/ATP mode can be authorized or forbidden (neither to enter nor to exit a platform for example) by the surveillance operator GAMA authorization and removal is entirely managed by Signalling system. Command to be provided by ATS & GAMA authorization will be executed by ATC
3	GAMA (Geographical Automatic Mode Actuator) Zone	For GAMA function, please refer section 13.3 of document Final System (UTO) Operating Data (STPT-GCC-DOC-002177-R07)	A GAMA Zone is an area where operation in UTO/ATO/ATP mode can be authorized or forbidden (neither to enter nor to exit a

			platform for example) by the surveillance operator. GAMA authorization and removal is entirely managed by Signalling system. Command to be provided by ATS & GAMA authorization will be executed by ATC
4	Work zones	For work zone function, please refer section 13.4 of document Final System (UTO) Operating Data (STPT-GCC-DOC-002177-R07)	Work Zone is entirely managed by Signalling system. Command to be provided by ATS & GAMA authorization will be executed by ATC
5	Auto wash plant	For auto wash function, please refer section 13.5 of document Final System (UTO) Operating Data (STPT-GCC-DOC-002177-R07)	ATS shall automatically route the trains in accordance with the pre-defined online timetable to the washing zone, interact with wash plant to carry out train wash and re-route the trains back to its original berthed location or to a new berthing track decided by DC. Signalling system will acquire Wash Plant Enabled/ Disabled status meaning is Wash plant is enabled for Washing or not. If enabled, signalling system would be able to set route for trains automatically based on washing schedule through washing plant and restrict speed of train under 5 kmph to enable washing.
6	Remote Wake up and sleep	For Remote Wake up and sleep function, please refer section 13.5 of document Final System (UTO) Operating Data (STPT-GCC-DOC-002177-R07)	The wake-up of a train is carried out in UTO mode either automatically according to the timetable for train stabled on the mainline and according to launching timetable for train stabled in the depot.
7	Creep Mode	If train is at standstill in UTO (unable to move), operator can command Creep mode activation. If command is eligible, an output will be provided to	Command by operator through ATS. Onboard ATC to provide output to Rolling Stock for train movement. If command is

		Rolling Stock to move the train with maximum speed of 10 kmph. Onboard ATC continuously monitors over speeding	eligible, onboard ATC to monitor speed of the train. In UTO mode, Creep mode command has to be given by Traffic operator through remote command.
8	Door Inhibition	<p>In case a PSD door or a train door is faulty then the corresponding train door / PSD door will not be opened.</p> <p>In such an event, train or PSD / train door inhibition message will be sent to Signalling system.</p> <p>During approach phase to a station, Signaling system will exchange door information from PSD and train doors, if any door is isolated then signaling system will automatically send corresponding PSD / Train inhibition request to the concerned sub-system (i.e. either PSD controller or train door control unit).</p>	SIG is responsible for the train/PSD door inhibition.

