
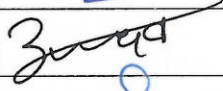




SPECIFICATION	SCHEDULE OF TECHNICAL REQUIREMENTS FOR LHB AC SMART COACHES WITH GPS BASED PUBLIC ANNOUNCEMENT & PASSENGER INFORMATION SYSTEM (PAPIS), LED DESTINATION BOARD, CCTV AND ON-BOARD CONDITION MONITORING SYSTEM (OBCMS)	MMDTS:19030 Rev.: 02 Date: 18.07.2022 Page: 1 of 13
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Name	Designation	Signature	Date	Level
Shashank Srivastava	SSE/Design		18/07/2022	Prepared
Abhinav Yadav	SME/Design-III		14.11.2022	Agreed
Lalit Kishore	Dy. CME/Design		14.11.2022	Reviewed
D. K. Singh	CDE		14.11.2022	Approved

Issue/ Rev	Details of changes	Date
01	Changes in title and structure of specification along with multiple changes in the software and hardware requirements.	27 th January 2022
02	Clause no. 15 "Eligibility Criteria" deleted.	18 th July 2022


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Foreword

Condition monitoring and predictive maintenance hold the key to increase reliability and availability of rolling stock on the Indian Railways network. The smart coaches have been conceived to gather the real time data from various subsystems and generate actionable alerts post analysis. Smart coaches also enhance the passenger experience by providing an array of safety and infotainment features.

1. Scope

This specification covers the general and technical requirements for design, development, supply, commissioning, and after sales service of IoT (Internet of Things) on LHB AC coaches termed as Smart Coaches. Through smart coaches, IR shall be able to monitor vital safety and passenger amenity systems remotely and create actionable alerts for the concerned authorities in case of any deviation from the norm. Each smart coach shall have a computing unit to control and integrate the digital systems on board. Smart coaches shall be able to deliver the expected performance independently and in rake formation. Smart coaches shall integrate GPS based PAPIS, Digital Destination Board (DDB), Emergency Call System (ECS), On Board Condition Monitoring System (OBCMS) for wheel, bearing and track, and toilet sensors, and others. The specification defines the various subsystems for their construction, fitment, and integration process.

This specification is structured into two parts. Part I briefly lists the hardware and software required for the Smart Coaches. Part II covers the detailed functional and design requirements for Smart Coaches.

The bidder shall provide the cost breakup for the offer. The item-wise cost quoted shall be considered to account for any variation in quantity of supply.

2. Abbreviations

DDB	Digital Destination Board
ECS	Emergency Call System
ETB	Ethernet Train Backbone
OBCMS	On-Board Condition Monitoring System
PAPIS	Public Address and Passenger Information System
PICCU	Passenger Information and Coach Computing Unit
FAC	First AC Coach
2T	AC-2 Tier Coach
3T	AC-3 Tier Coach
BAC	AC Pantry Car Coach
PC	Power Car Coach

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Part I: SCOPE OF SUPPLY

A. List of Hardware

Sl. No.	Description of Requirement	Quantity Per Coach				
		FAC	2T	3T	BAC	PC
1	Passenger information and coach computing unit (PICCU).	1	1	1	1	1
2	Water Level Sensing Module					
	(A) Water level sensor	1	1	1	1	1
	(B) Water level indicators	3	3	3	3	3
3	Emergency Push Button in lavatories (Twist release standard stop/emergency button complying to the design principles of ISO 13850).	4	4	4	2	0
4	802.11ac compliant Wi-Fi router with inbuilt antenna (Signal strength shall not be less than -67 dBm anywhere inside coach).	1	1	1	1	1
5	18.5-inch IP based LCD display panel.	0	2	2	2	1
6	18.5-inch Touch Screen IP based LCD display panel for Power Car.	0	0	0	0	1
7	Aesthetic 10-inch LCD display in each coupe of FAC	8	0	0	0	0
8	Flush mounted digital destination board (DDB) with 2-line display.	2	2	2	2	2
9	GSM-GPS combo antenna with anti-theft protection provisions.	1	1	1	1	1
10	6-Watt speakers with SS mounting bracket.	11	11	11	10	3
11	Adjustable gooseneck microphone with mute button (for guard announcement).	0	0	0	0	1
12	Power Over Ethernet (POE) IP camera (Dome Type) with minimum resolution of 1080p HD and appropriate brackets for mounting where applicable.	6	6	6	6	4
13	Full-duplex Emergency Call System (ECS) Flush mounted ECS console with call and answer buttons, microphone, and speaker.	2	2	2	2	1
14	Ethernet Switch (at least 16 ports and EN50155 compliant).	1	1	1	1	1
15	Wireless OBCMS					
	(A) Wireless Sensing Node (WSN) on each axle end.	8	8	8	8	8
	(B) Data concentrator (DC) unit.	1	1	1	1	1
	(C) RF Antenna for communication between DC and WSNs.	1	1	1	1	1
	(D) Secured mounting arrangement for WSN.	8	8	8	8	8
	(E) Appropriate mounting bracket and fasteners for DC.	1	1	1	1	1

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----------------------	--	--

16	(A) CAT6A cable/optic fibre cable/twisted pair for Ethernet Train Backbone (ETB) and connecting PICCU to peripheral systems such as OBCMS, PAPIS, DDB and others as per IEC 61375.	To be estimated by the bidder according to the feasible wiring plan.
	(B) UIC standard inter-vehicular (IV) coupler & connectors for all required wiring.	
17	Labour, material, tools, wire, cables, connectors, fasteners, brackets and any other concomitant accessory or item that might not be mentioned but essential for satisfactory functioning of the system shall be under the scope of supply of the bidder.	As required for satisfactory functioning of complete Smart Coach system at industry standards.
18	The offer shall include recommended list of spare parts required for day-to-day maintenance of the smart coach equipment. At least 10% spares of all critical hardware shall be maintained at MCF by the supplier. Any replacement request under the warranty shall be covered through this account and shall be later recouped by the supplier.	

B. List of Software/Applications/Cloud Services/GSM Service/Function

Sl. No.	Description of Requirement
1	Operating System (OS) for each PICCU.
2	(A) Application for audio and visual annunciation inside coach. (B) Pre recorded audio files for PAPIS (required to be updated with change in train service). (C) Maps and journey stops for required routes.
3	Application for public announcement through guard terminal PICCU.
4	(A) CCTV application to record the feed from cameras in each coach (Resolution and FPS of recording should be customisable). (B) CCTV application shall have the functionality to export a custom duration of recorded video to USB drives on PICCU in MP4, AVI, MKV formats (output resolution choices: 480p, 720p, 1080p). (C) Self-diagnosis function to detect any error with cable and camera.
5	(A) Mobile phone applications (both Android and iOS platform) named "Travel Mate" shall be designed and hosted on the respective application stores Passenger to be authenticated and given access to the infotainment content using PNR only; Complete PNR list for the journey shall be fetched at the start of journey with periodic updates at the stations where charting is done. (B) Captive portal login on Wi-Fi hotspot for passengers to access infotainment content (C) Application to update content for the infotainment system periodically over GSM network. As the PICCU are connected with each other, the files should be downloaded in an efficient manner and shared with all connected PICCU automatically.

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----------------------	--	--

6	Application on PICCU to communicate and integrate toilet sensors, OBCMS, PAPIS. Collected data shall be uploaded and stored on cloud server securely and in encrypted form.
7	Web server application to process and analyze the data uploaded by PICCU and generate actionable alerts automatically through emails and SMSs.
8	Single web portal to access all the data monitored by PICCU with standard filtering and sorting (should include Coach wise, Rake Wise, and Depot wise views). Web portal shall have data analysis, alert, and escalation functions for Smart Coach Systems (including OBCMS).
9	Software-as-a-Service (SaaS) on secured cloud data centre physically located in India for 6 years (This includes applications, data storage, Runtime, Middleware, Operating System, virtualization, servers, storage and networking).
10	GSM network subscription to facilitate required data transmission between PICCU and Cloud at 4G/LTE for 6 years.
Note	Use of any licensed or proprietary software/application should be avoided as far as possible. If unavoidable, the requisite number of licences shall be obtained and renewed to cover the warranty period.


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Part II: FUNCTIONAL AND DESIGN REQUIREMENTS

1. Passenger Information and Coach Computing Unit (PICCU)
[Guiding/Governing/Functional Specification: RDSO/CG-18001 (Rev.1)]

PICCU shall be an integrated, scalable, upgradable industrial computer complying to IEC60571-1 or EN50155. It shall act as the central processing unit (CPU) for GPS based PAPIS, DDB, CCTV and other connected subsystems. It shall comprise components and systems to deliver requisite functionality. PICCU shall be fitted in the switch board cabinet (SBC) of the coach. SBC has the electrical supply available at 750 V AC, 415 V AC, and 110 V DC. The electrical department shall approve the power rating for the system (all electrical components and subsystems) in the scope of this specification. PICCU shall have all inbuilt voltage converter and inverter to meet the power requirements. PICCU shall meet the following minimum requirements:-

- 1.1 Standard 64-bit processor of reputed make with at least 8 MB cache memory and 2.0 GHz clock speed.
- 1.2 GNU Linux / Windows standard release operating system.
- 1.3 At least 8 GB DDR4 SDRAM with capability expandable up-to 32 GB.
- 1.4 At least 128 GB on board memory or industrial mSATA drive for OS and applications.
- 1.5 Removable and swappable SSD media for infotainment content storage of 1 TB.
- 1.6 Removable and swappable SSD media for CCTV content in cyclic manner of 1 TB or more capacity.
- 1.7 Removable SD card/Micro SD card of 64 GB storage for emergency storage of data in case of SSD failure. SD card/Micro SD shall be accessible through Service port.
- 1.8 Built in 7 inch touch screen having minimum 800x480 resolution for user interface.
- 1.9 Cellular network module for wireless communication (shall handle all the data communication requirements) with dual SIM card port, SMA connectors, and roof-mounted IP67 rated GSM-GPS combo antenna (anti-theft design). The SIM card slots shall be accessible for replacement of SIM cards.
- 1.10 50 channels NMEA-0183 compatible GPS receiver with positional accuracy within 5-meter radius under open sky, 95% of the time. It shall use the GSM-GPS combo antenna mentioned in 1.9.
- 1.11 Compact design for LED Power on indication in front of system.
- 1.12 Reset push button on backside of PICCU to factory reset and reboot.
- 1.13 IP65 rated fan-less design of PICCU enclosure within 3U rack mounting to ensure fitment in SBC (1U equals 1.75-inches; 3 x 1.75" = 5.25-inches).
- 1.14 Inbuilt 4G/LTE and GPS module to connect with the internet.
- 1.15 PICCU to be tagged with an alphanumeric identifier (MCF-PICCU-XXXXXXXXX); where XXXXXXXXX shall be the coach number. This identifier shall be configurable and protected with authentication. [Refer 14.1.6 of RDSO/CG-18001 (Rev 1) for details].
- 1.16 Compliance with temperature and humidity requirements as per EN50155 standard.
- 1.17 Inbuilt power supply unit for 110V DC with short circuit protection fuse in input.
- 1.18 Electromagnetic interference (EMI) filter assembly (with inbuilt stabilizers) to suppress any unwanted spikes and surges from power lines or other systems.
- 1.19 Shielded and earthed against electromagnetic/static induction in the operating conditions.

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1.20 All the specifications and design related information for comprising systems must be documented and provided in soft and hard copies. The documentation will include operating, maintenance, and troubleshooting manuals.

Following communication interfaces shall be inbuilt in the PICCU

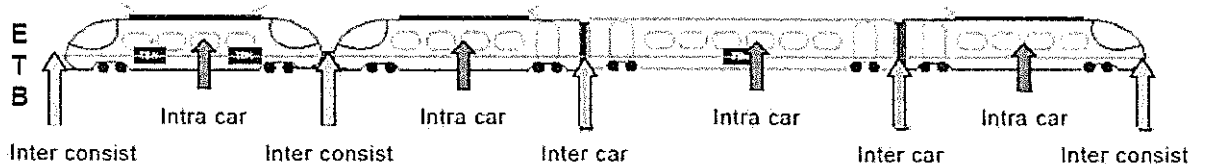
- 1.21 Cellular network module shall support 2G (GSM, GPRS, and EDGE), 3G (UMTS, CDMA2000, and HSPA) and 4G (LTE).
- 1.22 Standard protocols like HTTP, FTP, SMTP, IMAP, TCP, IP, VoIP, and others shall be available on PICCU.
- 1.23 Audio input ports with (min 500V isolation), standard microphone input, 100V audio out, and minimum 80 Watt (peak to peak) dual amplifier for driving up to twelve 6 Watts speakers having LMT suitable for online speakers.
- 1.24 Type A USB ports (minimum two) at front and back each (to support data transfer, system backup, and restore) with M12 connectors; required number of electrically isolated RS 485 and RS232 with M12/Military Grade connectors.
- 1.25 Industrial Ethernet port for train wide network.
- 1.26 One VGA and one HDMI ports.

Following communication devices shall be connected with PICCU: -

- 1.27 Wi-Fi router (compliant to IEEE 802.11 AC wireless networking standard) inside coach to let passengers access infotainment services.
- 1.28 Managed network switch (EN50155 certified) with M12 connectors.

2. Ethernet Train Backbone (ETB)

ETB shall be made of physical lines along the train to connect the active network devices like PICCU, OBCMS, PAPIS, *et cetera* together. These lines shall use passive components such as cables and connectors, dedicated to Ethernet. The cabling and connectors for different regions (inter consist, inter car, and intra car; as represented below, Source: IEC 61375) shall be according to their context and environment. The complete design and hardware of ETB shall comply with the requirements of IEC 61375 and shall be under the scope of supply of the bidder.



3. Public Address and Passenger Information System (PAPIS)

[Guiding/Governing/Functional Specification: RDSO/SPEC/AC/D/0087-2008 (Rev-1) and RDSO/CG-18001 (Rev.1)]

PAPIS shall provide the all required information to the passengers to make their journey convenient and handle emergent situations.

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----------------------	--	--

- 3.1 GPS location-based logging of speed (kmph) and distance run (km) every minute.
- 3.2 Display and announcement of essential passenger information such as current train location (preferably through info graphics like maps or line diagram), next halting station, current time, late running status, train speed, toilet occupancy status, and other PAPIS related information to be displayed inside the coach regularly in Hindi, English, and regional language.
- 3.3 Essential passenger information (safety/running/commercial) should be provided in multilingual format (HINDI, ENGLISH, and a Regional Language) (including alarms, maps and informational video content).
- 3.4 Aesthetic flush mounted DDB generally as per RDSO CG – 18001 (Rev.1) linked to the PICCU on RS 485 bus with suitable lookout window design.

4. Infotainment System

Infotainment system is conceived as a congregation of train information and entertainment (music, movie, documentary, *et cetera*). Passengers shall be able to access the infotainment content using smart phone, tablet, or laptop. The content shall be accessible through captive portal login on Wi-Fi hotspot or through mobile applications. The infotainment content page layout shall be designed suitably to provide essential information like train speed, next arriving station, toilet occupancy, and other important announcements directly on their devices. Passengers shall be able to access desired content even without the internet.

The entertainment content (audio and video files) shall be provided by Railway (Depot/Zone). The system shall be designed to protect the licensed contents from any unauthorised use. The entertainment content shall be able to update over the air through cellular networks. The connected PICCU shall act as a single unit to support downloads of big-sized files and synchronize the data.

5. On Board Condition Monitoring System (OBCMS)

[Guiding/Governing/Functional Specification: Railway Board's OBCMS/DCM/N/1, November 2016]

The OBCMS shall monitor the health and safety of key components: wheel, bearing, and track. Such a system would finally result in improved safety, improved reliability, higher utilization, increased up time and reduced operation cost of the railway assets by enabling predictive maintenance and reduction in sudden catastrophic failures of these assets.

WSNs shall communicate the sensors data to DC. The DC of OBCMS shall be connected with PICCU (over ethernet or wireless network).

6. Closed-circuit television (CCTV) or Video Surveillance

[Guiding/Governing/Functional Specification: ICF/MD/SPEC-269, ISSUE STATUS: 02, Rev. : 00].

[Drawing No.: ICF/SK3-9-0-161 alt-c for AC coaches].

The smart coaches shall be equipped with video surveillance system to record the events during journeys. These recordings might prove helpful in investigating any mishappening or tragic event. Any recording shall be kept on the PICCU for a period of one month before being overwritten by the latest data. The CCTV system shall have the following capabilities.

- 6.1 IPv4/IPv6 Power Over Ethernet (POE) cameras (Dome Type) integrated with PICCU for CCTV application. The cameras must not protrude more than 25 mm from the ceiling.


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- 6.2 Cameras should have day and night vision.
- 6.3 Video shall be recorded with GPS and time stamp on bottom right corner.
- 6.4 On demand remote CCTV live feed viewing and recording capability on the smart coach web portal.
- 6.5 CCTV system shall have self-diagnostic ability to indicate the errors in operations related with camera reception or cabling. The state of error shall be clearly visible on PICCU.

7. Emergency Call System (ECS)

Passengers shall be able to contact the train conductor or the guard in case of any emergent situation. All such calls shall be handled by PICCU through the Ethernet Train Backbone (ETB). The logs of all such calls shall be recorded by PICCU. During such a call, the guard console shall display the live feed from that particular coach and camera to show the caller.

8. Water Level Sensing Module

The module shall indicate the status of water level in the underslung water tanks. The real time analysis of relevant parameters shall raise SMS alerts to the next water station on the route when the level indicated changes from "Medium" to "Low". The web portal shall have the functionality to manage the contacts of watering authority at nominated watering stations. The data analysis should enable IR to determine the optimal distance between watering stations. The module shall consist of:

- A. Water level sensor - pressure transducer to estimate the water head above it
- B. Water level indicators - Three level (for Low, Medium, and Full) LED colour indicators; Quantity: one inside coach and two outside under sidewall.

The threshold levels for Low, Medium, and Full shall be configurable in PICCU and protected by authentication.

9. Emergency Push Button in Lavatories

[Guiding/Governing/Functional Specification: RDSO/CG-18001 (Rev.1)]

This is to alert the fellow passengers of a coach about the assistance required in a particular lavatory. The button shall be of twist release standard stop/emergency button type complying to the design principles of ISO 13850. A press of button shall be indicated on the coach LED screens with sound. The location of the button in the lavatory shall be ergonomically designed keeping the possible scenarios with children, elderlies, and differently abled people. The location of the Emergency Push Button is required to have approval of CDE/MCF.

10. System Integration with PICCU

Following subsystems shall be integrated with PICCU, directly or indirectly through ETB, to store monitored data and analyze on cloud. Application programming interfaces (APIs) may be required to be developed or obtained from OEMs to communicate with the following modules. The supplier shall provide the application(s) on the PICCU and web to access information from connected peripherals.

- 10.1 Public Address and Passenger Information System (PAPIS)
- 10.2 Infotainment system


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10.3 On Board Condition Monitoring System (OBCMS)

10.4 CCTV System

10.5 Water Level Sensor

10.6 Emergency Call System (ECS).

10.7 Toilet occupancy sensors.

Limit switches on the door latch assembly are available in the lavatory module [Drg. No. LW56475]. Their status ["Vacant" or "Occupied"] shall be displayed on the respective PAPIS screens. Toilet etiquettes shall be displayed and announced on PAPIS on suitable occasions.

10.8 Emergency Push button in lavatory.

11. Web and Mobile Phone Applications for Smart Coach System

11.1 Mobile phone applications (both Android and iOS platform) shall be designed and hosted on the respective application stores for the use by passengers. The apps shall authenticate passengers and give access to the infotainment content using PNR only; Complete PNR list for the journey shall be fetched at the start of journey with periodic updates at the stations where charting is done.

11.2 Mobile phone applications (both Android and iOS platform) shall be designed and hosted on the respective application stores for the railway users. All smart coach monitored systems and related information and alerts shall be pushed through the apps. Railway users shall be authenticated using login credentials and crucial accesses shall be authenticated by OTP.

11.3 Single web portal to access all the data monitored by PICCU with standard filtering and sorting (should include Coach Wise, Rake Wise, and Depot wise views). Web portal shall have data analysis, alert, and escalation functions for Smart Coach Systems (including OBCMS). The web portal shall internalize the acknowledgement and escalation structure.

Any name, word, phrase, logo, symbol, design, image, or a combination of these elements developed in the process shall be approved by MCF and shall be the intellectual property of MCF.

12. Smart coach web portal hosting, access, and management

12.1 The supplier shall host the web portal and database of the smart coaches on standard secured cloud services (like Rail-Tel, NTT, Microsoft, IBM and Amazon) with physical data centre located in India.

12.2 Web based application and database service to automatically synchronise all data from PICCU's of the smart coach fleet. The application should display the essential parameters on a dashboard. Also, smart phone applications with authentication shall permit the railway users to monitor the dashboard. The layout of the dashboard shall be designed with MCF consultation.

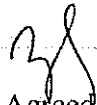
12.3 Automatic regular upload/download of all operating data of PICCU and connected equipment from smart coaches.

12.4 Automatic generation analytical reports for predictive and corrective maintenance by IR.

13. Miscellaneous Requirements

13.1 Change of train composition and orientation of coaches might be required for train operation. The smart coach system shall be designed so that the network configuration should be reconfigured automatically. For this, train topology discovery protocol (TTDP) as per IEC 61375 shall be implemented.


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SPECIFICATION	SCHEDULE OF TECHNICAL REQUIREMENTS FOR LHB AC SMART COACHES WITH GPS BASED PUBLIC ANNOUNCEMENT & PASSENGER INFORMATION SYSTEM (PAPIS), LED DESTINATION BOARD, CCTV AND ON-BOARD CONDITION MONITORING SYSTEM (OBCMS)	MMDTS:19030 Rev.: 02 Date: 18.07.2022 Page: 11 of 13
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- 13.2 PICCU or any other connected subsystem shall not allow any stray or unauthorized device to communicate with the smart coach system. Whole system shall be designed to deny access to all unidentified or malicious or spoofing devices.
- 13.3 Any update for software, configuration settings, infotainment content, and even encryption keys for Smart Coaches shall be able to update over the air (OTA) through cellular network and also via USB ports on PICCU.
- 13.4 All connectors shall be IP65 rated or higher and shall comply with the RDSO specification no. RDSO/CG-18001 (Rev.1).
- 13.5 All the required software/program/application and their installation/updation/support during warranty period and subsequent AMC shall be in the scope of supply of the firm.
- 13.6 PICCU shall queue the data to be uploaded to the cloud storage in local cache whenever the cellular connectivity is not available. The cached data shall be uploaded promptly when smart coaches find the network available.
- 13.7 As multiple sensors and equipment need to be integrated with PICCU, the compatibility issues may arise due to different underlying OS/programs. The applications shall be developed with a view to have compatibility with various makes of all interconnected systems. Any additional hardware or software to facilitate the same shall be in the scope of the supplier.
- 13.8 All fitment material, labour, and design changes required shall be in the scope of bidder.
- 13.9 Any additional fixtures & labour required for the fitment of the smart components [DDB, PICCU] in the coach shall be in the scope of supply of the firm. The bidder shall take approval of MCF before fitment on the coach.
- 13.10 Application programming interfaces (API) might be required for the integration of data from various sensors and equipment. The responsibility to develop API or procure from the OEMs shall reside with the bidder.
- 13.11 In case of any conflict with RDSO/CG-18001-(Rev.1), the RDSO specification shall supersede.
- 13.12 All the sensors and equipment of the smart coach shall be firmly mounted on the coach with anti-pilferage measures (if required) to sustain the loads under normal operating conditions.
- 13.13 The details of Subscriber Identification Module (SIM) used in the system shall be shared with MCF.
- 13.14 The login credentials to the web portal (User ID & Password) should be provided to MCF & base depots after successful completion of the training of using the portal. The portal shall have different user access levels to control and define the rights and privileges on the portal.
- 13.15 Demonstration of working of all smart coach equipment on the portal post installation and commissioning shall be done by the supplier.
- 13.16 The provided solution, wholly and individually, should be compliant to IR and UIC standards (wherever not adequately covered by IR standard)
- 13.17 Required testing (as per the latest versions of specified standards) and quality declarations by the firm and OEM should be provided.
- 13.18 Stickers for Smart coach items like Emergency Push Button, Infotainment System, and Emergency Call System shall be in the scope of bidder. The bidder shall require approved design/drawing of the stickers by CDE/MCF.

8
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38
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SPECIFICATION	SCHEDULE OF TECHNICAL REQUIREMENTS FOR LHB AC SMART COACHES WITH GPS BASED PUBLIC ANNOUNCEMENT & PASSENGER INFORMATION SYSTEM (PAPIS), LED DESTINATION BOARD, CCTV AND ON-BOARD CONDITION MONITORING SYSTEM (OBCMS)	MMDTS:19030 Rev.: 02 Date: 18.07.2022 Page: 12 of 13
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13.19 Decalcomania (decal) sticker of Smart Coach shall comply to RDSO specification RDSO/2010/CG 08. The design/ drawing shall be approved by CDE/MCF.

14. Cyber Security Requirements

The supplier must apply the policies and practices of the standard IEC 62443 relating to the cyber security of the industrial installations for all the systems of its supply. The application of this standard shall have to be evaluated by an independent accredited body and the certificate shall be submitted to MCF as a prerequisite for the commissioning. Moreover, the bidder shall comply with following requirements:-

- 14.1 Declare the country of origin of components and products used in the system.
- 14.2 The Smart Coach system shall be designed to appropriately limit the rights for system access and configuration through identification and authentication control. Multifactor authentication methods like combinations of password, OTP, security questions, and Digital Signature Certificate (DSC) shall be used to protect critical access and control.
- 14.3 The Smart Coach system shall have the intrusion detection and prevention system to avert any cyber-attack. A monthly report on cyber-integrity of the system shall be provided by the bidder during the warranty period. All essential data shall be archived regularly on offline storage media.

15. Eligibility Criteria - DELETED

16. Method of Prototype Approval

Prototype approval from CDE/MCF shall be obtained before bulk supply by the supplier based on the fitment and commissioning in one coach at MCF. Any change or deviation in drawing, material supplied, or any other approved delivery shall need re approval from CDE/MCF.

17. Integration of Existing Smart Coach Fleet

The supplier shall bear the responsibility to integrate the data from existing smart coaches on the web portal. At present, the number of such smart coaches is 100. These coaches have all the prescribed hardware (sensors/equipment). The data from the PICCU of these coaches need to be integrated with the system envisioned in this specification. All requirements of reprogramming and provision of software for the integration shall be under the scope of supply by the supplier.

18. Warranty Clause

On-site replacement/repair/debugging of all the equipment/sensor/program supplied under the scope shall be covered by the bidder for a period of 6 years (72 months) from the date of commissioning Or 7 years from the date of supply whichever is earlier.


19. Penalty Clause

The complete smart coach system shall be functional all the time. In case of any abnormal behaviour or malfunctioning of the installed system, the same shall be informed to the supplier by respective coaching depot. The concern/ defect/ malfunctioning shall be attended within 48 hours, beyond which penalties shall be levied as per contract conditions.

20. After Sales Services

20.1 Installation, commissioning, and proper functioning under warranty period is the responsibility of the bidder.


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SPECIFICATION	SCHEDULE OF TECHNICAL REQUIREMENTS FOR LHB AC SMART COACHES WITH GPS BASED PUBLIC ANNOUNCEMENT & PASSENGER INFORMATION SYSTEM (PAPIS), LED DESTINATION BOARD, CCTV AND ON-BOARD CONDITION MONITORING SYSTEM (OBCMS)	MMDTS:19030 Rev.: 02 Date: 18.07.2022 Page: 13 of 13
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20.2 Any software or application update or upgrade essential for designed performance, security, and integrity of system shall be the responsibility of the bidder during the warranty period.

21. Documentation to supplement the understanding, planning, execution, maintenance, and troubleshooting of Smart Coach systems. Following shall be provided by the bidder at the time of submission of the tender.

21.1 Detailed Gantt Chart to integrate with MCF's production stages with clear timelines

21.2 Detailed wiring diagrams, connection diagrams, and sensor/equipment fitting on the coach drawings. This shall include a booklet containing the principle of working/algorithm for each of the sensors.

21.3 Bill of material with detailed leaflet, documentation in soft and hard for each coach.

Operating, Maintenance and Troubleshooting manuals in hard and soft copies for each coach shall be provided by the bidder.


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