Government of India
Indian Railways

FUNCTIONAL REQUIREMENTS SPECIFICATION
FOR
UNATTENDED AXLE BOX LEVEL ACCELERATION MEASUREMENT SYSTEM

Issued By:

Track Machine & Monitoring Directorate Research
Designs and Standards Organization

Manak Nagar, Lucknow - 226011

TABLE OF CONTENTS

S.No.	*Topic*	*Pg.No.*
1.	Definitions & Abbreviations	3
2.	General	3
3.	Environmental Conditions	4
4.	Salient Features	4
5.	Requirements for Measurement of acceleration	5
6.	Processing of data and Reports Generation in Cloud/ Processing Station	6
7.	Maintenance and Calibration of System	7
8.	Warranty	8
9.	Penalty for down time of the system during warranty and Maintenance period	8
10.	Acceptance Tests	9
	Annexure	
	Annexure-I: The drawing of the LHB coach and Bogie & Vande Bharat coach and Bogie	10 - 19
	Annexure-II: RFID Tags	20 - 24
	Annexure-III: Route files	25 - 26
	Annexure-IV: Formats of exception reports	27 - 31
	Annexure-V: System architecture of UABAMS	32-32

Functional Specifications of Unattended Axle Box Level Acceleration Measurement System

Desirable Requirements of Technical Specification – The following details are desired in the technical specification of "Unattended Axle Box level Acceleration Measurement System (UABAMS)".

a) UABAMS system shall be installed in revenue trains of IR in first and last vehicle.
b) Axle Box Acceleration above threshold limit should be reported through SMS to field users in real time along with its chainage.
c) The data of UABAMS should be sent through GSM network to CRIS server for integration in TMS.
d) The number of UABAMS systems installed in IR may be to the tune of 2000 nos. in near future.

1. Definitions and Abbreviations:

IR	: Indian Railway
ICF	: Integral Coach Factory
RDSO	: Research Designs and Standards Organisation
Purchaser	: Indian Railways, Ministry of railways
MMD	: Maximum Moving Dimension
TMS	: Track Management System
GPS	: Global Positioning System
SD	: Standard Deviation
RMS	: Root Mean Square

2. General:

2.1. The Unattended Axle Box Acceleration Measurement System (UABAMS) is a system having capability to measure acceleration at Axle Box level in the last vehicle of a revenue train without human interference. It will be referred as system in subsequent clauses of this document.

2.2. The last vehicle of the revenue train where the system is proposed to be mounted will have standard FIAT Bogie and LHB coach/ Vande Bharat Bogie and coach. The drawing of the LHB coach and Bogie/ Vande Bharat coach and Bogie where system is proposed to be mounted is attached as Annexure-I.

2.3. Accelerometers, all system hardware and their mounting arrangements shall be installed within the Maximum Moving Dimension (MMD) envelope of IR as per Schedule of Dimension (SOD) - 2022 and latest correction slips. The same is available at http://www.indianrailways.gov.in.

2.4. The scope of specifications includes supply and installation of system, capturing of data, storage and processing of data in cloud or processing station to generate various reports

including analysis of historic data and transfer of same to concerned P. Way officials and TMS. The Scope also includes online generation of safety alerts in the form of text messages (sms/ notifications) to nominated railway officials, whenever recorded accelerations exceed the pre-defined limits. The purchaser shall be able to edit these pre-defined limits system wise and/ or route wise as and when required.

2.5. All data and reports in cloud or processing station shall be stored in a database or ASCII file which shall be compatible for uploading in TMS. Two types of data files are to be uploaded in TMS. i) Spatial acceleration data, ii) Processed data having peaks, RMS value and SD values for 200m block and Kilometre. Format of TMS data will be provided after award of Contract.

2.6. All file formats shall be open and documented.

2.7. The following norms are to be referred along with this draft specification for compliance;

- EN 13848: 2020 – part I – Railway applications – Track – Track geometry quality. Part I – Characterization of Track Geometry.
- EN 50155: 2021 - Railway applications – Rolling stock – Electronic equipment.

3. Environmental Conditions:

3.1. The System shall be capable of functioning in the climatic conditions prevalent on Indian Railway. The machine shall be in continuous operation under the following general service conditions:

I.	Ambient temperature	-	0^0 C to 55^0 C
II.	Humidity	-	Upto 100%
III.	Rain fall	-	Fairly heavy
IV.	Atmospheric condition	-	Very dusty, Heavy fog

3.2. On IR network the electrified traction consists of overhead electric system of 25000 V AC or 2*25000 V AC with residual return current passing through one of the rails in the track and systems and accessories which are part of electronic train running safety system such as Train protection warning system (TPWS), Audio frequency track circuit (AFTC), Digital axle counter, DC track circuiting, Mobile Phones and wireless sets in very close proximity. These shall not affect the accuracy of acceleration and location measurements in any manner due to the induction effect."

4. Salient Features:

4.1. The system shall be capable to measure acceleration in the speed band of 20-160 Kmph.

4.2. The system shall be capable to start automatic acquisition of acceleration at speed above 20 Kmph and online transfer of spatial data (data in distance mode) to cloud or processing station through GSM network. System should have enough storage space to store the acquired acceleration data for the period of non-availability of GSM signal for data transfer.

4.3. On availability of GSM signal, the stored spatial acceleration data shall be transferred to cloud/ processing station and the storage space shall be cleared automatically after transmission of data to cloud or processing station and receipt of confirmation. No data shall be lost during period of non-availability of GSM signal for a distance of 500 Kilometers. The system must generate online alerts whenever the recorded accelerations exceed pre-defined limits in form of text messages (SMS)/ notifications for concerned p-way officials of Zonal Railways.

In case of multiple peaks exceeding the pre-defined limits in close vicinity, only one sms/ notification for highest peak recorded (vertical and lateral accelerations separately) in distance of 50m shall have to be sent.

4.4. The accelerometers/ sensors shall be mounted on both left and right side of one axle of FIAT bogie/ Vande Bharat bogie and these shall be capable for measurement of acceleration in vertical and lateral direction.

4.5. The data logger unit shall be mounted on under frame of the coach and communication & data transfer from accelerometer to data logger unit shall be wired/wireless.

4.6. The Junction box consisting of microcontroller can be mounted either on under frame or inside the coach at a convenient location. The communication between data logger and junction box shall be wired/ wireless. Firms are free to design the integrated system consisting of Junction Box and Data Logger.

4.7. The GPS and GSM antenna shall be mounted on roof of coach or on other suitable location within MMD and should be safe from tampering by outsiders

4.8. All transducers and system hardware shall be securely installed on the Bogie and Coach with proper protective shields to ensure that these are not damaged during running and are pilferage proof. The design of mounting arrangement of transducers and system hardware shall be got approved from purchaser i.e. Indian Railways before actual adoption.

4.9 The system shall have its own power supply battery pack/ Self generation of power for uninterrupted working of the system. The system should operate from its own power supply battery pack/Self generation of power for uninterrupted working of system for up to a period of one week. Power supply battery pack shall be charged from the available DC power supply of 24 volt from coach battery. Power supply failure alarm should be generated on the cloud so that necessary action can be taken.

4.10 The system shall be capable to identify the track/route using pre prepared route data file having latitude and longitude to be provided by the purchaser and some proven navigation system, which shall include GPS, RFID reader, odometer or pulse from ABS etc. with synchronization. RFID tags written with information as per Annexure-II will be installed by the concerned Zonal Railway.

5. Requirements for Measurement of acceleration:

5.1. The accelerometers mounted on axle box level shall be capable to measure accelerations up to +100g in the frequency range of 0 - 500 Hz Or latest provision of EN 13848:part – I.

5.2. As the expected range of frequency of acceleration at axle level is up to 500 Hz, The sampling frequency of acceleration shall not be less than the 5 times of the expected maximum frequency. Thus the sampling frequency at axle level shall not be less than 2500 Hz Or latest provision of EN 13848:part – I.

5.3. The location of acceleration peaks shall be acquired accurately using some proven navigation system, which may consist of a GPS, RFID tag and an odometer/ pulse from ABS. The technical details of RFID tag proposed to be installed on IR track are attached as Annexure-II.

5.4. The accuracy for reporting location of acceleration peaks shall be better than 5.0 metre.

5.5 a. “The least count of the accelerations to be measured shall be better than + 0.1g”.
b. The accuracy of acceleration measurement in repeatability at same speed (± 5 kmph) and in identical condition shall be 0.3g or better.

6. Processing of data and Reports Generation in Cloud/ Processing Station:

6.1. The system should be capable of processing data for online generation of safety alerts in the form of text messages (sms/ notifications) to nominated railway officials, whenever recorded accelerations exceed the pre-defined limits. (This clause to be read along with clause 4.3.)

6.2. The cloud or Processing station is to be established or acquired by the firm to get data transferred from various systems (which may be up to 100) installed in various revenue trains and plying on different routes. To create storage on cloud or processing system number of kilometre recorded per month by a single train system may be taken as 30000-40000 Kms.

6.3. The cloud or processing station shall be capable to receive the data from 100 systems and it shall receive the data unsolicited *i.e.* the system will send the data as and when the GSM signal is available.

6.4. The data acquired acceleration in space domain at the selected sampling interval and generated reports are to be stored for every run for latest 03 months. However every 5^{th} run, acceleration data acquired/reprocessed in space domain and generated report are to be stored for 01 year in the cloud or Processing Station. The storage requirement of data will be reviewed after warranty. The Cloud or Processing station shall be designed to have facility for extending the storage capacity in future.

6.5. To identify the correct route and track associated to a particular system, the processing station shall incorporate a track map to appropriately localise the measured acceleration peaks and allow the users a graphical selection of the track to view and investigate. Turnouts in main line and other track features e.g. Bridge Level crossing etc. shall be included in the map from route file to correlate acceleration with these track features. The format of route file is attached as Annexure-III.

6.6. The acceleration data transferred from various systems plying on IR to cloud or processing station shall be stored and processed to create reports for specified sections for three segregated accelerations levels as per choice of user showing information given in Annexure-IV and degradation pattern of historic data.

6.7. The details of specified sections associated to each system will be provided by the purchaser and shall be stored in the cloud or processing station for generation of section wise report. The details of section will include Railway, Division, Section, From KM and To KM.

6.8. The limiting values above which the exception reports are to be generated will also be provided by the purchaser and shall be stored in cloud or Processing station.

6.9. Analog chart for vertical and lateral acceleration for spatial data at all the two locations (left & right axle).

6.10. Generation of kilometre wise exception reports of acceleration exceeding 03 predefined limits at all the three locations where accelerometer has been mounted in the desired format.

6.11. Generation of exception report for printing of SD and RMS value for every block of 200 metre in a kilometre and for whole kilometre. The last block of kilometre may be less or more than 200 metre depending on physical length of kilometre subject to maximum block length of 250 metre. If the distance in last block of a kilometre is more than 50 metre it will be treated as a separate block.

6.12. The formats for analog chart and exception reports to be generated as per requirements of para 6.09 to 6.11 at processing station are attached as Annexure-IV.

6.13. Facility for comparison of spatial acceleration data in analog form and exception reports in digital form for up to any 10 previous recordings and assessment/plotting of deterioration pattern in the desired format, which will be finalised after award of contract.

6.14. The facility to add, delete and edit any train in cloud or processing station shall be available. In addition to this, facility shall be provided for detailed analysis of the status of the software and hardware of any system plying on IR network from cloud/processing station.

6.15. **Client Work Stations:** User shall be able to connect to the cloud or processing station through standard browser. At least Firefox and Chrome shall work. Connection is established via a login name and password. At least the following user level shall be defined.

a. Standard user who will be able to browse the data and reports being generated.

b. Data administrator, who in addition to browsing of data can validate the defects

c. System administrator, who in addition to browsing the data can create, enable and delete login credentials, edit the predefined acceleration limits.

7. Maintenance and Calibration of System:

7.1. The Firm shall specify the frequency/ periodicity in their technical bid, considering reliability of the system and type of calibration and maintenance required for accelerometers and other equipment/sensors.

7.2. The periodic maintenance of all equipment and sensors is to be done by the supplier during warranty period and for 05 years CAMC period after warranty period at major cities of India i.e. New Delhi, Kolkata, Chennai, Mumbai, Secundrabad, Banglore and Guwahati/ Dibrugarh. The car will be available for generally 3-4 consecutive hours in washing line under open sky for maintenance.

7.3. The dynamic calibration of accelerometers is required to be done by at any govt./ ISO accredited/ certified lab, thus the accelerometers shall be replaced with the pre calibrated sensors. No additional payment will be made for replaced sensors.
The car will be available for 3-4 consecutive hours in washing line under open sky for maintenance. The maintenance work should be carried out along with other routine maintenance of coach.

7.4. The System shall have the capability to communicate any malfunctioning of system to cloud/processing station and can be accessible from the cloud/processing station to update the filters, update the software release, monitor the system status and also it can be remotely rebooted except in the case of malfunctioning of the GSM antenna.

7.5. Maintenance of cloud/processing station and data processing is to be done by the supplier during warranty period and for a period of 05 years after warranty.

7.6. The supplier shall keep sufficient spares to keep the system in working order at all the time and minimize the down time. In case of any problem, the system shall be made operational within a period of 36 hours at halting nominated metro cities after communication of problem by Railway official.

8. Warranty:

Warranty to be dealt as per relevant paras of Special Condition of Tender/ Contract.

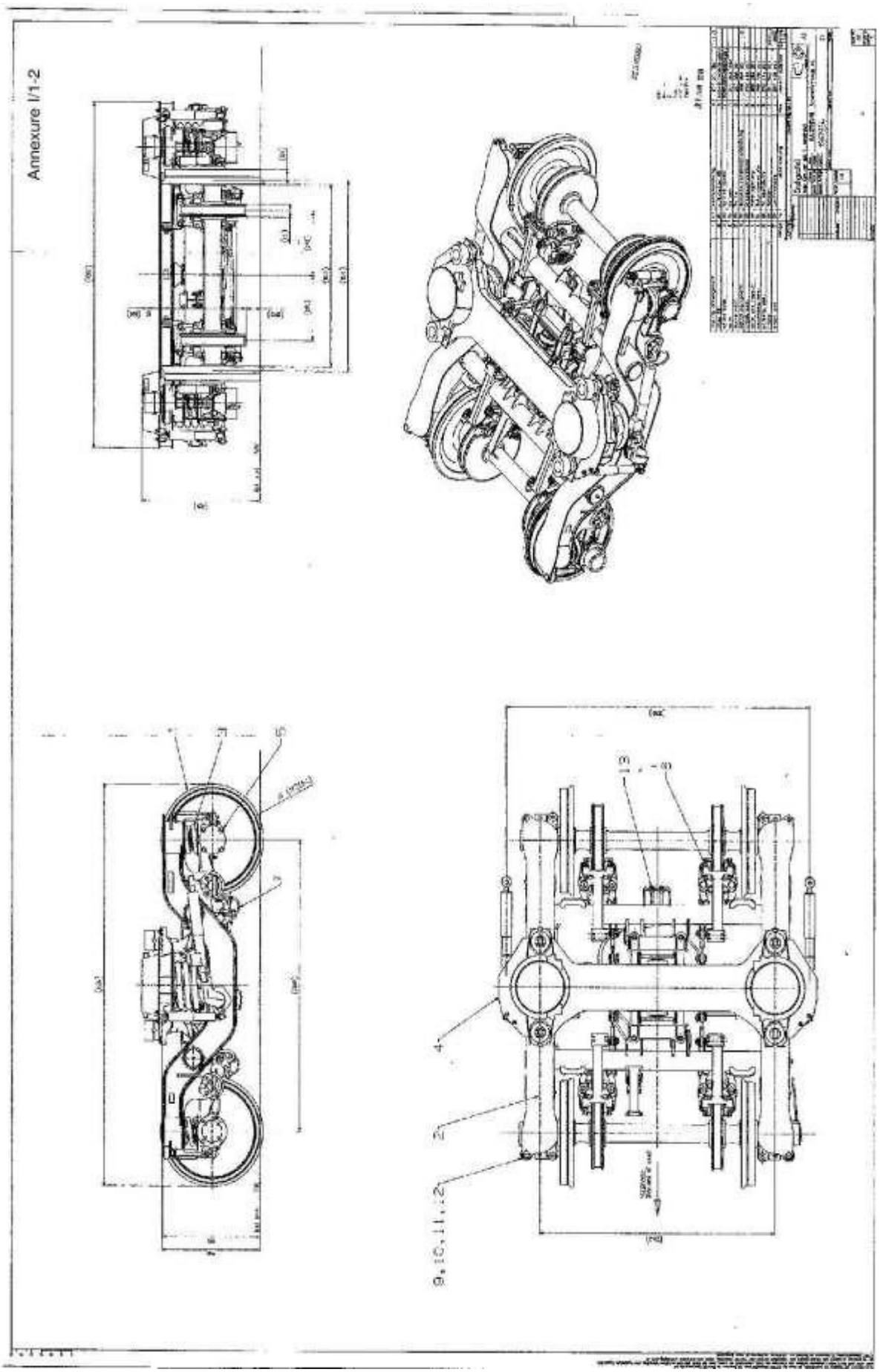
9. Penalty for down time of the system during warranty and Maintenance period:

Issues of payment during downtime to be dealt as per relevant paras of Special Condition of Tender/ Contract.

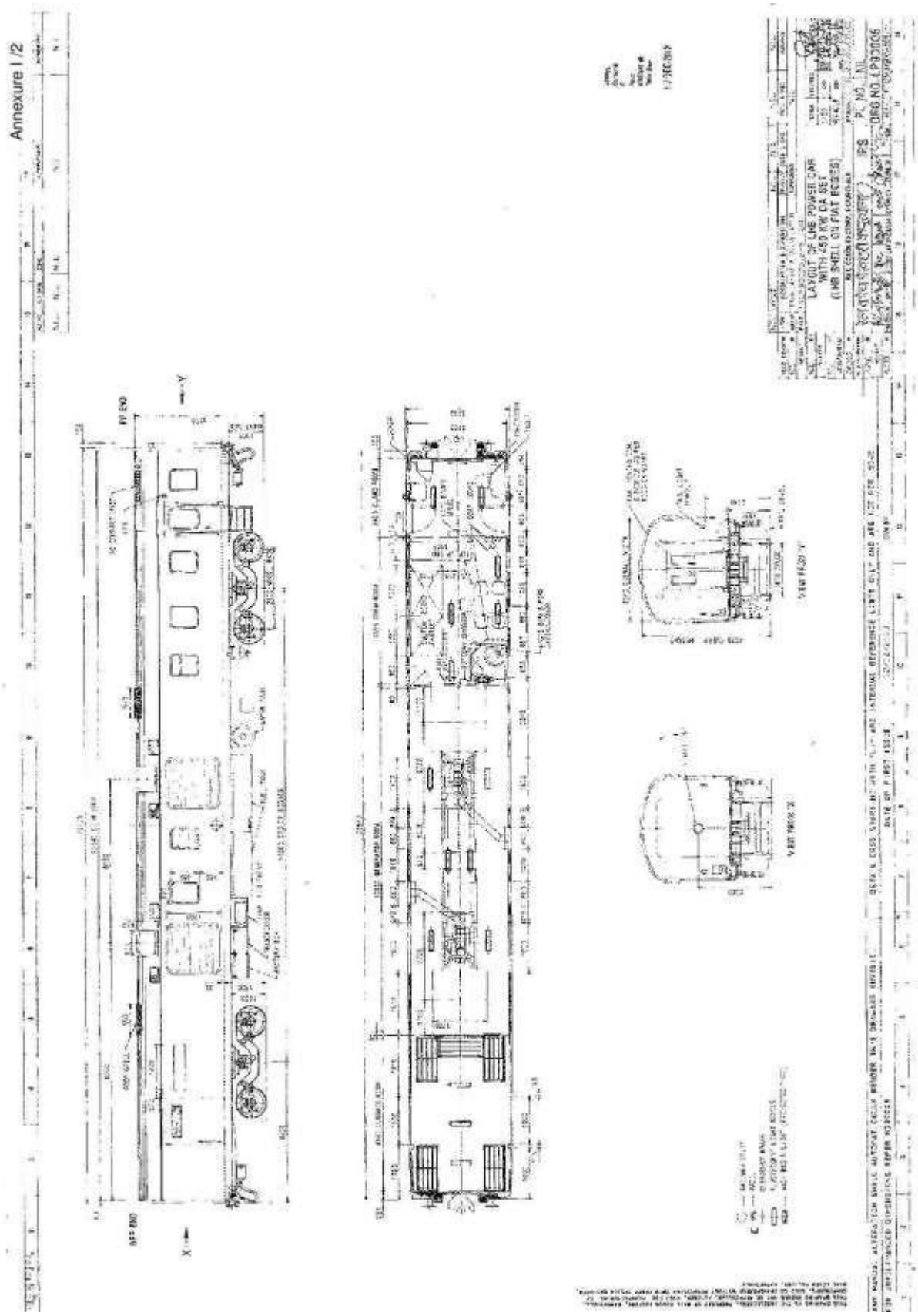
10. Acceptance Tests: Firm shall provide a lab and field validation scheme, which will be approved by the purchaser. The scheme shall include the following;

a) Verification of test and calibration certificates for all the third party items.
b) The testing of hardware of system as per approved procedure.
c) Verification of analog reports, exception reports and degradation patterns.
d) Repeatability of acquired acceleration data at same speed. The accuracy of acceleration measurement in repeatability at same speed and in identical conditions shall 1% of full scale offset (FSO) or better.

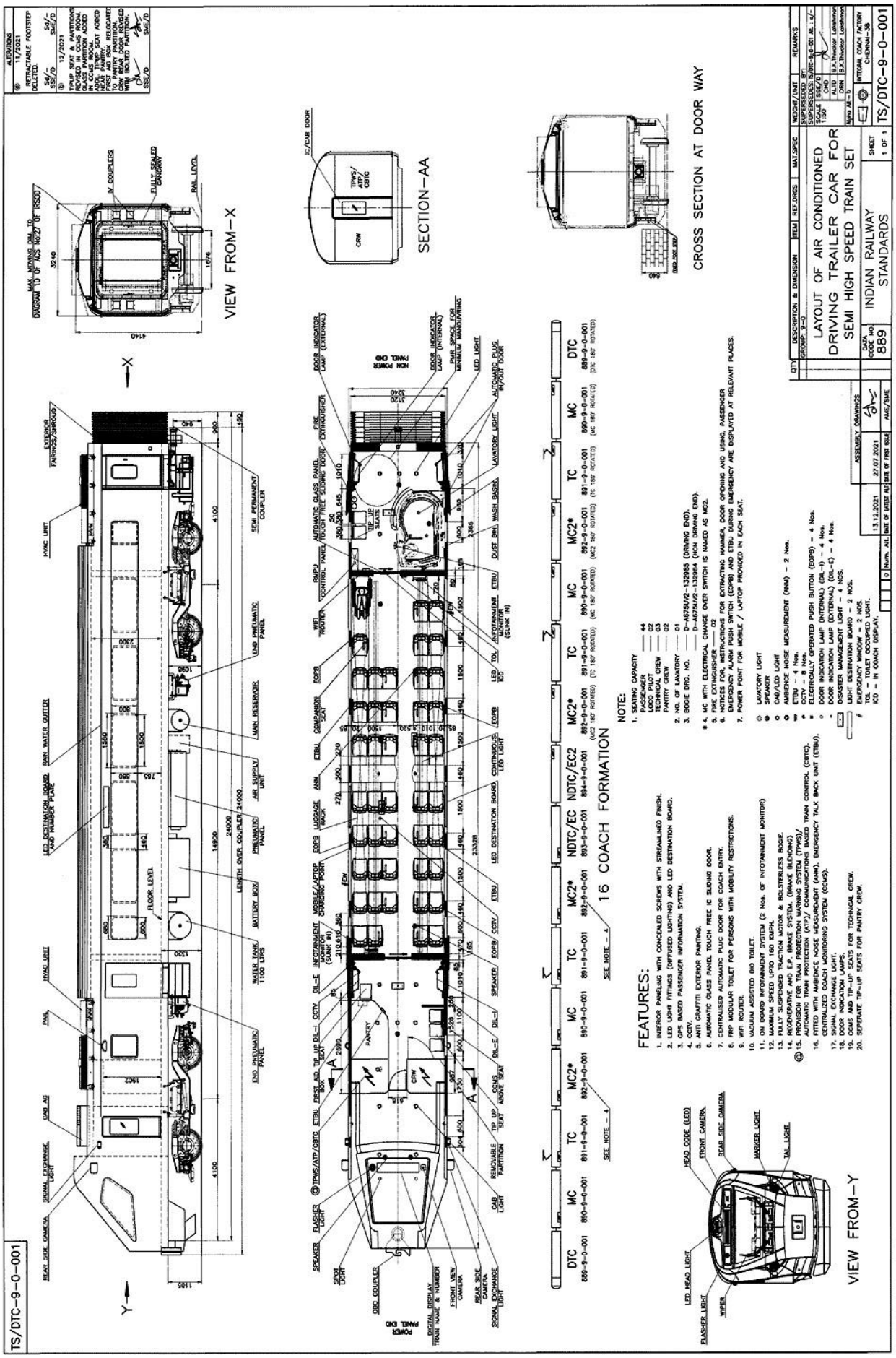
Annexure I/1-2

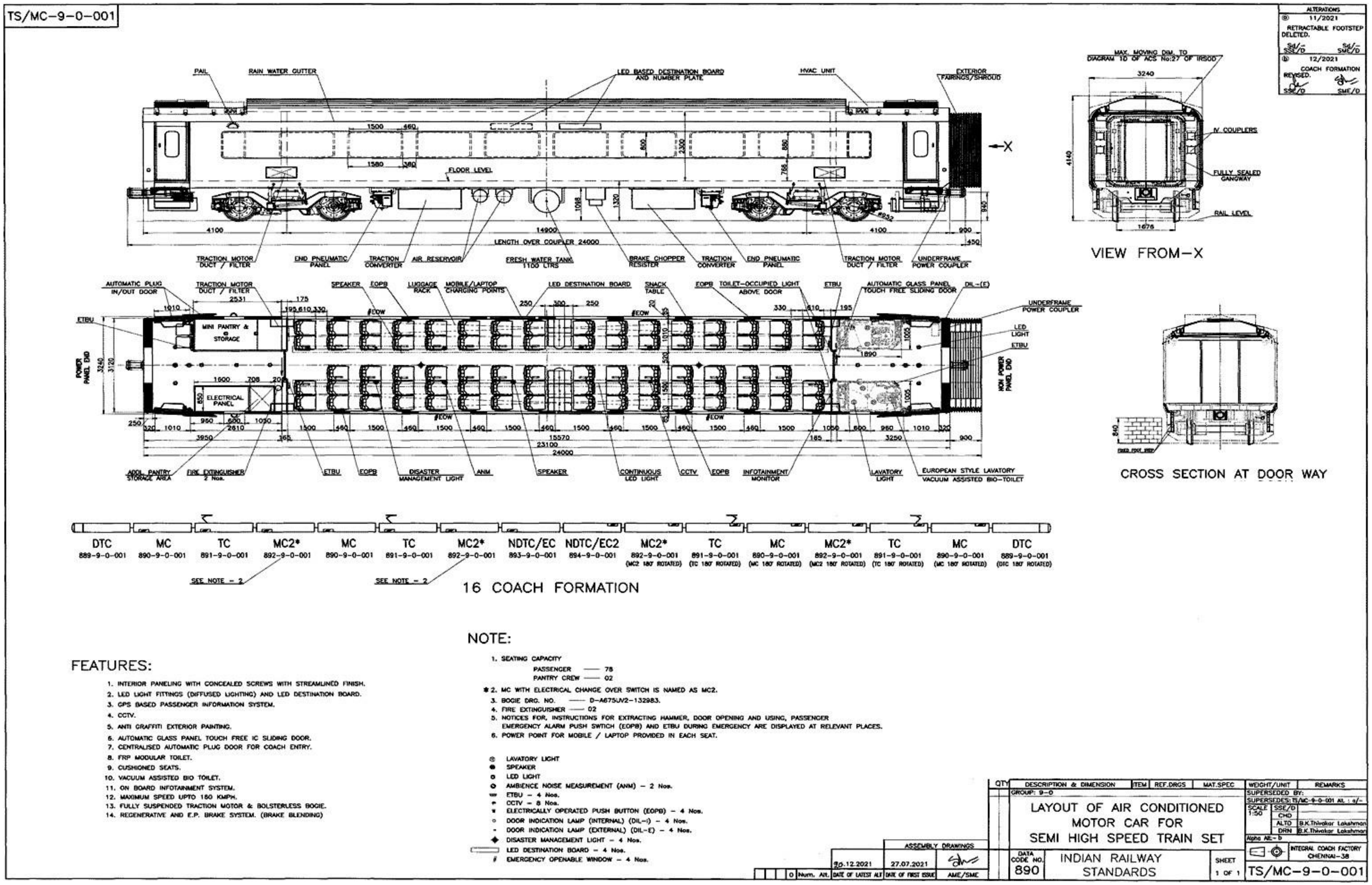


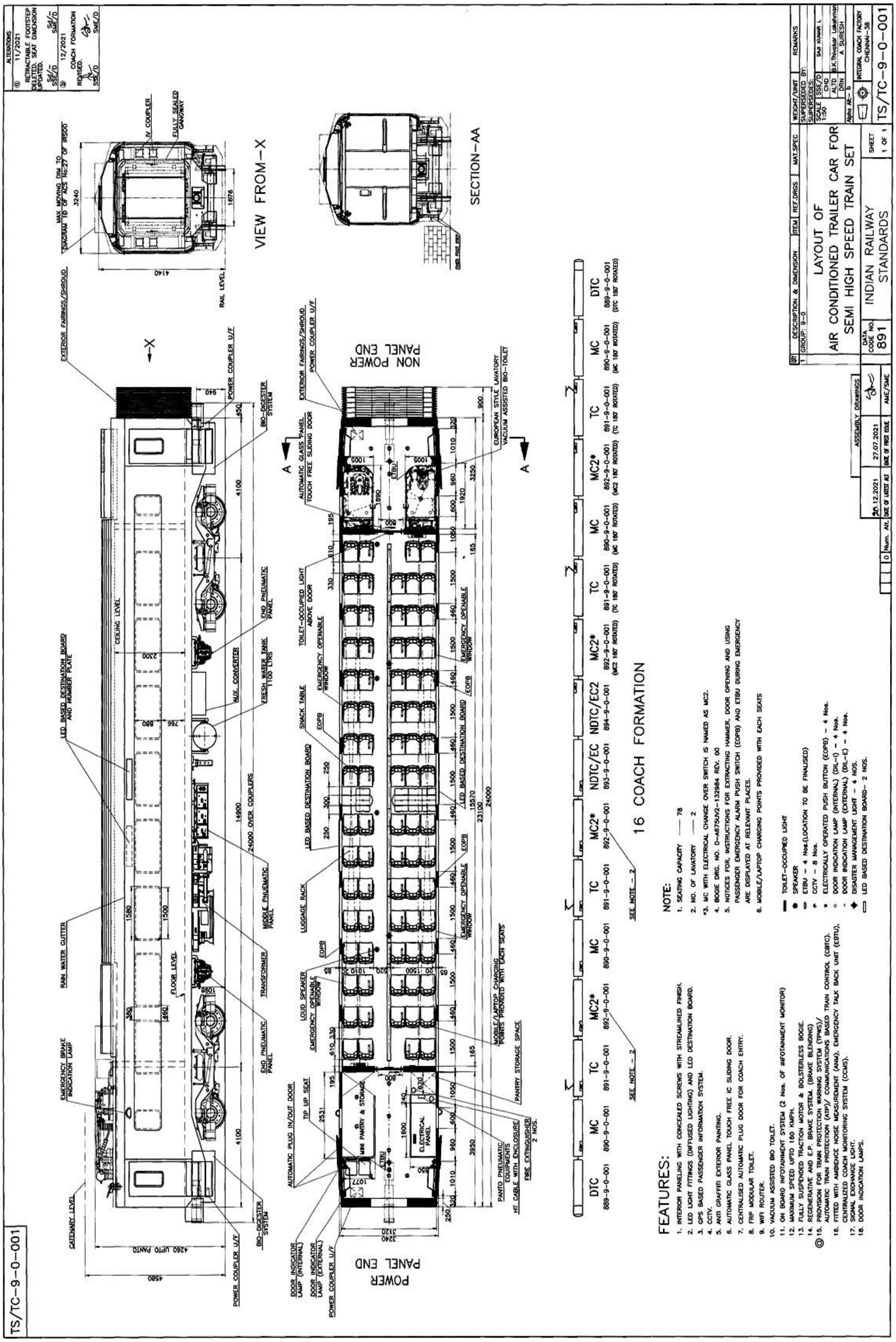
Annexure I /2


LAYOUT OF LINE POWER CAR
WITH 450 KW DA SET
(LHB SHELL ON FIAT BOGIES)

Ref : QO-D-7.1-1		Date Issued: . .2023	TM/IM/434

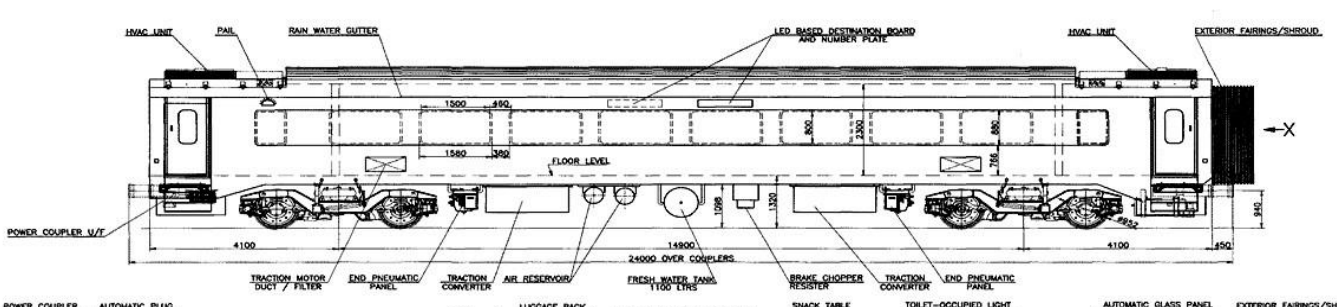


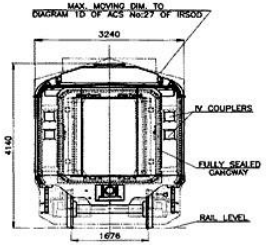

TS/MC-9-0-001
VIEW FROM-X
CROSS SECTION AT DOOR WAY
16 COACH FORMATION
DTC MC TC MC2* MC TC MC2* NDTC/EC NDTC/EC2 MC2* TC MC MC2* TC MC DTC
SEE NOTE - 2
NOTE:
1. SEATING CAPACITY
PASSENGER — 78
PANTRY CREW — 02
*2. MC WITH ELECTRICAL CHANGE OVER SWITCH IS NAMED AS MC2.
3. BOGIE DRG. NO. — D-A675UV2-132983.
4. FIRE EXTINGUISHER — 02
5. NOTICES FOR, INSTRUCTIONS FOR EXTRACTING HAMMER, DOOR OPENING AND USING, PASSENGER EMERGENCY ALARM PUSH SWITCH (EOPB) AND ETBU DURING EMERGENCY ARE DISPLAYED AT RELEVANT PLACES.
6. POWER POINT FOR MOBILE / LAPTOP PROVIDED IN EACH SEAT.
LAVATORY LIGHT
SPEAKER
LED LIGHT
AMBIENCE NOISE MEASUREMENT (ANM) - 2 Nos.
ETBU - 4 Nos.
CCTV - 8 Nos.
ELECTRICALLY OPERATED PUSH BUTTON (EOPB) - 4 Nos.
DOOR INDICATION LAMP (INTERNAL) (DIL-I) - 4 Nos.
DOOR INDICATION LAMP (EXTERNAL) (DIL-E) - 4 Nos.
DISASTER MANAGEMENT LIGHT - 4 Nos.
LED DESTINATION BOARD - 4 Nos.
EMERGENCY OPENABLE WINDOW - 4 Nos.
FEATURES:
1. INTERIOR PANELING WITH CONCEALED SCREWS WITH STREAMLINED FINISH.
2. LED LIGHT FITTINGS (DIFFUSED LIGHTING) AND LED DESTINATION BOARD.
3. GPS BASED PASSENGER INFORMATION SYSTEM.
4. CCTV.
5. ANTI GRAFFITI EXTERIOR PAINTING.
6. AUTOMATIC GLASS PANEL TOUCH FREE IC SLIDING DOOR.
7. CENTRALISED AUTOMATIC PLUG DOOR FOR COACH ENTRY.
8. FRP MODULAR TOILET.
9. CUSHIONED SEATS.
10. VACUUM ASSISTED BIO TOILET.
11. ON BOARD INFOTAINMENT SYSTEM.
12. MAXIMUM SPEED UPTO 160 KMPH.
13. FULLY SUSPENDED TRACTION MOTOR & BOLSTERLESS BOGIE.
14. REGENERATIVE AND E.P. BRAKE SYSTEM. (BRAKE BLENDING)
LAYOUT OF AIR CONDITIONED
MOTOR CAR FOR
SEMI HIGH SPEED TRAIN SET
INDIAN RAILWAY
STANDARDS
890
INTEGRAL COACH FACTORY CHENNAI-38
TS/MC-9-0-001



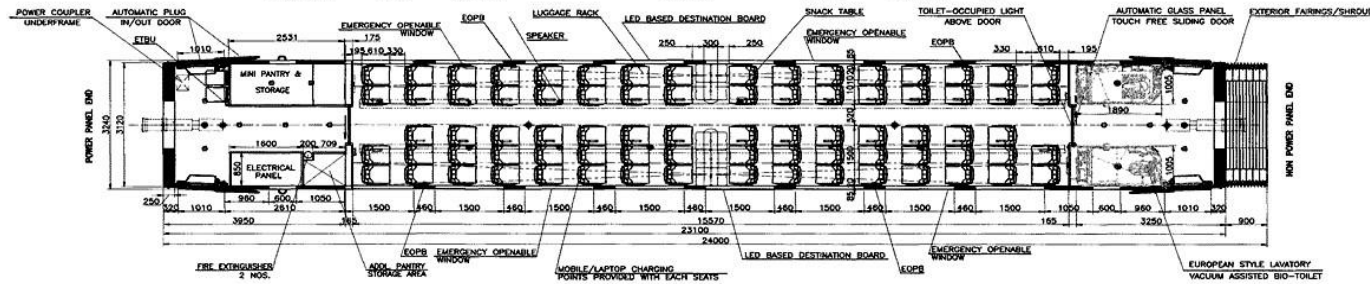
TS/TC-9-0-001
VIEW FROM-X
SECTION-AA
16 COACH FORMATION
POWER PANEL END
NON POWER PANEL END
LAYOUT OF AIR CONDITIONED TRAILER CAR FOR SEMI HIGH SPEED TRAIN SET
INDIAN RAILWAY STANDARDS
INTEGRAL COACH FACTORY CHENNAI-38
FEATURES:
NOTE:
1. SEATING CAPACITY — 78
2. NO. OF LAVATORY — 2

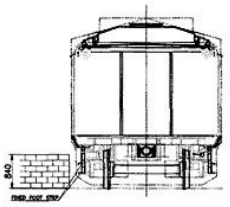
TS/MC2-9-0-001



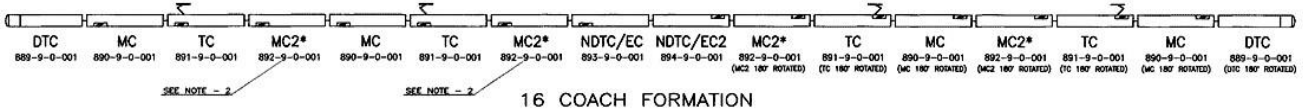


VIEW FROM–X





CROSS SECTION AT DOOR WAY



16 COACH FORMATION

FEATURES:

1. INTERIOR PANELING WITH CONCEALED SCREWS WITH STREAMLINED FINISH.
2. LED LIGHT FITTINGS (DIFFUSED LIGHTING) AND LED DESTINATION BOARD.
3. GPS BASED PASSENGER INFORMATION SYSTEM.
4. CCTV.
5. ANTI GRAFFITI EXTERIOR PAINTING.
6. AUTOMATIC GLASS PANEL TOUCH FREE IC SLIDING DOOR.
7. CENTRALISED AUTOMATIC PLUG DOOR FOR COACH ENTRY.
8. FRP MODULAR TOILET.
9. CUSHIONED SEATS.
10. VACUUM ASSISTED BIO TOILET.
11. ON BOARD INFOTAINMENT SYSTEM.
12. MAXIMUM SPEED UPTO 180 KMPH.
13. FULLY SUSPENDED TRACTION MOTOR & BOLSTERLESS BOGIE.
14. REGENERATIVE AND E.P. BRAKE SYSTEM. (BRAKE BLENDING)

NOTE:

1. SEATING CAPACITY
   PASSENGER —— 78
   PANTRY CREW —— 02
* 2. MC WITH ELECTRICAL CHANGE OVER SWITCH IS NAMED AS MC2.
3. BOGIE DRG. NO. —— D–A675UV2–132983.
4. NOTICES FOR, INSTRUCTIONS FOR EXTRACTING HAMMER, DOOR OPENING AND USING PASSENGER EMERGENCY ALARM PUSH SWITCH (EOPB) AND ETBU DURING EMERGENCY ARE DISPLAYED AT RELEVANT PLACES.
5. MOBILE/LAPTOP CHARGING POINTS PROVIDED WITH EACH SEATS

- ◎ LAVATORY LIGHT
- ● SPEAKER
- ○ CAB/LED LIGHT
- ⊙ AMBIENCE NOISE MEASUREMENT (ANM) – 2 Nos.
- ⇔ ETBU – 4 Nos.
- ▪ CCTV – 8 Nos.
- ■ ELECTRICALLY OPERATED PUSH BUTTON (EOPB) – 4 Nos.
- ▫ DOOR INDICATION LAMP (INTERNAL) (DIL–I) – 4 Nos.
- ▬ DOOR INDICATION LAMP (EXTERNAL) (DIL–E) – 4 Nos.
- ◆ DISASTER MANAGEMENT LIGHT – 4 Nos.
- ⟹ LED BASED DESTINATION BOARD– 2 NOS.

ALTERATIONS
(a) 11/2021 RETRACTABLE FOOTSTEP DELETED. Sd/– SSE/D Sd/– SME/D
(b) 12/2021 COACH FORMATION REVISED. SSE/D SME/D

Qt	DESCRIPTION & DIMENSION	ITEM	REF.DRGS	MAT.SPEC	WEIGHT/UNIT	REMARKS
1	GROUP: 9–0				SUPERSEDED BY:	
					SUPERSEDES: TS/MC2–9–0–001. Alt.: a/1	

LAYOUT OF AIR CONDITIONED MOTOR CAR FOR SEMI HIGH SPEED TRAIN SET

SCALE 1:50	SSE/D	SAJI KUMAR L
	CHD	
	ALTD	B.K.Thivakar Lakshmanan
	DRN	A. SURESH
Alpha Alt:– b		

INTEGRAL COACH FACTORY CHENNAI–38

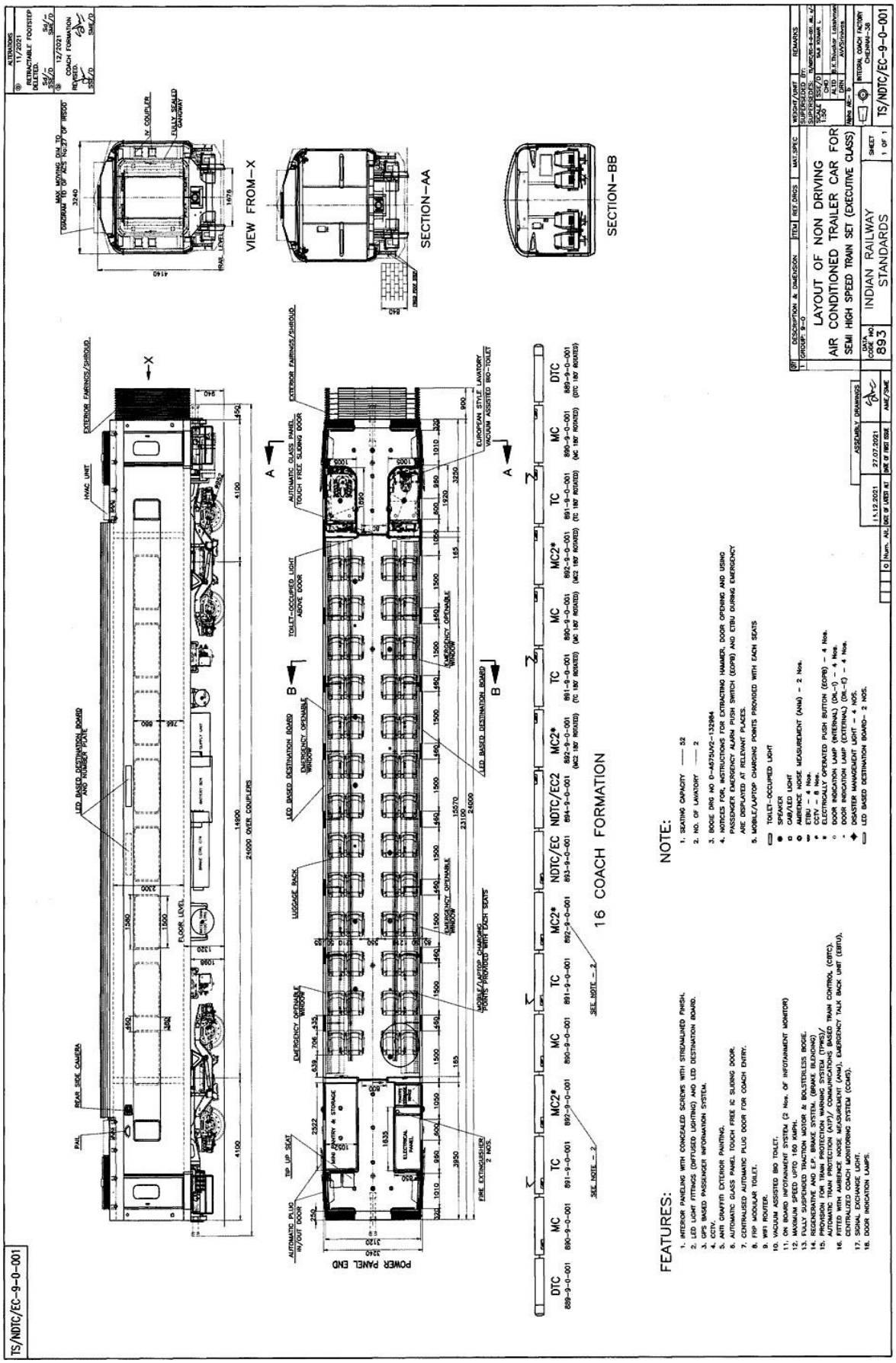
ASSEMBLY DRAWINGS					
0 Num. Alt.	28 12.2021 DATE OF LATEST ALT	27.07.2021 DATE OF FIRST ISSUE	AME/SME	DATA CODE NO. 892	INDIAN RAILWAY STANDARDS	SHEET 1 OF 1	TS/MC2–9–0–001
---	---	---	---	---	---	---	---

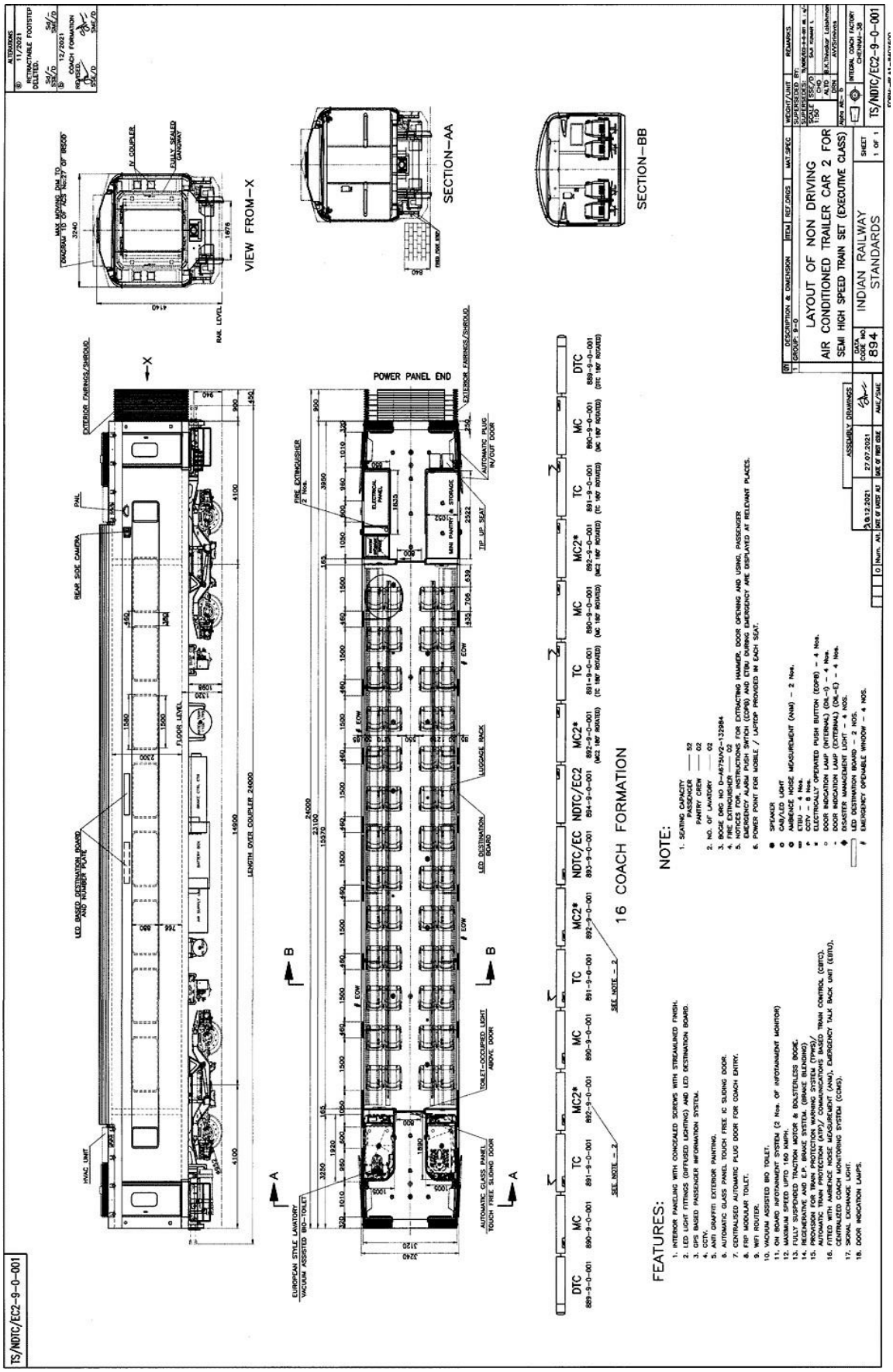
Ref : QO-D-7.1-1

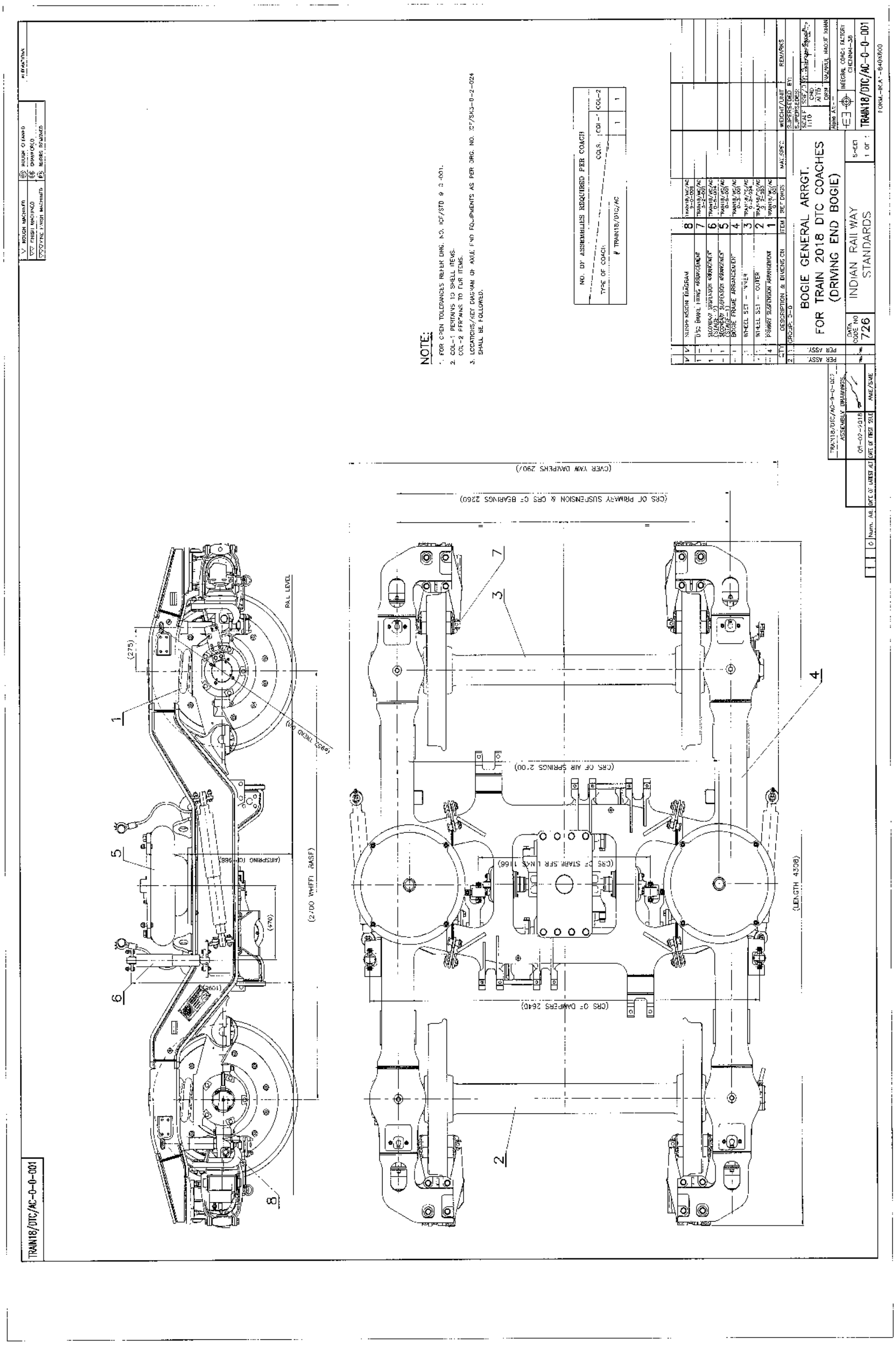
Date Issued: . .2023

TM/IM/434

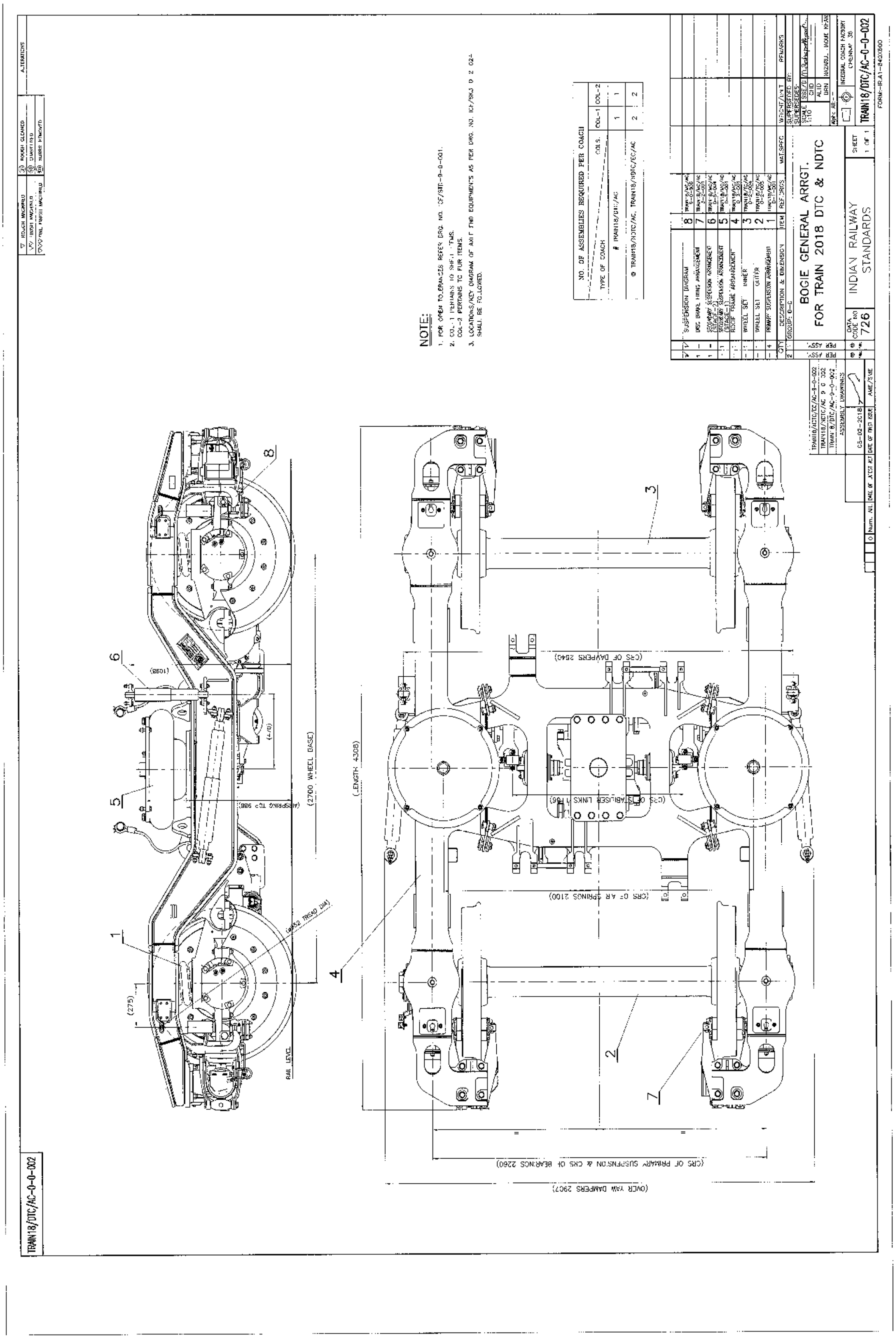
Ref : QO-D-7.1-1		Date Issued: . .2023	TM/IM/434




TS/NDTC/EC2-9-0-001
VIEW FROM-X
SECTION-AA
SECTION-BB
POWER PANEL END
16 COACH FORMATION
DTC 889-9-0-001
MC 890-9-0-001
TC 891-9-0-001
MC2* 892-9-0-001
NDTC/EC 893-9-0-001
MC2* 892-9-0-001
TC 891-9-0-001
MC 890-9-0-001
MC2* 892-9-0-001
TC 891-9-0-001
MC 890-9-0-001
MC2* 892-9-0-001
TC 891-9-0-001
MC 890-9-0-001
DTC 889-9-0-001
FEATURES:
NOTE:
LAYOUT OF NON DRIVING AIR CONDITIONED TRAILER CAR 2 FOR SEMI HIGH SPEED TRAIN SET (EXECUTIVE CLASS)
INDIAN RAILWAY STANDARDS
INTEGRAL COACH FACTORY CHENNAI-38
TS/NDTC/EC2-9-0-001



BOGIE GENERAL ARRGT. FOR TRAIN 2018 DTC COACHES (DRIVING END BOGIE)
INDIAN RAILWAY STANDARDS
TRAIN18/DTC/AC-0-0-001
NOTE:



BOGIE GENERAL ARRGT.
FOR TRAIN 2018 DTC & NDTC
INDIAN RAILWAY STANDARDS
TRAIN18/DTC/AC-0-0-002
NOTE:

Specification of RFID tag of open protocol:

(a) The ground/track installed tags are used with all types of Sleepers of the Indian Railways. These are typically placed at least 150 mm away from center (± 150 mm) of the sleeper, in-between the two rails.

(b) The tags on sleepers are mounted at sleeper top level. The base metal is steel, stainless steel or aluminum as per relevant Indian Railways standards.

(c) The tag specifications are, in general, as per GS1 standards and broadly aligned with the 'European Guideline for the Identification of Railway Assets using GS1 Standards'. The basic encoding standard applicable is SGLN195 of GS1.

(d) For understanding the data formats for use on the tags please read the associated document 'Guidelines for Data onboard RFID Tags of the Indian Railways Track' attached.

(e) The tag reader should work in conditions of EMI/ RFI as 25kV AC or 2x25 kV AC is used in overhead lines on tracks..

(f) Base standard of Tag being used will be: EPC Gen2 V1.2 or higher.

(g) Generic information on Tag:

- Concrete / metal mount type of tags.
- All standards as applicable for use of UHF RFID tags in India are applicable.

(h) The RFID Tags have a user memory of 3 kb or higher.

(i) Dynamic Performance of Tag used by IR: Minimum read rate based on circularly polarized reader antennas with 110º or more azimuth angle at a minimum distance of 1.0m and maximum distance of 2.0m up to a speed of 200 kmph.

(j) Sensitivity of tags is as under:

- The best case sensitivity is equal or better than 17 dBm
- The worst case values are more than 25.5 dBm, i.e., the variation between the worst case and the best case should 50% or less, keeping in mind that the scale is negative.

(k) Tags used by IR are as per IP68 housing standards. TRC will run under the most severe climatic conditions. This includes sandstorms, pelting rain, snow, heat, vibrations etc. Therefore, there should be no concern in reading the data from the tag under such conditions

Annexure –II/2

Guidelines for Data on board RFID Tags of the Indian Railways Track

EPC area:-The EPC area is ALWAYS read. From the Railways viewpoint it only stores the Information regarding the various features. Additionally, internally there is a lot of information about the Tag that is also stored including a unique identifier for each tag. The data is stored in a format prescribed by an international standard by an organisation called GS1 and the associated standard is GS1 SGLN 195 Allocation Rules.

Sl No	Field	Size	Comments
1	Version No	1	'D' is the default currently
2	Railway Zone	1	See Annexure- II/3
3	Railway Division	2	See Annexure-II/4 & II/5
4	Track Feature unique Identification Number as in TMS	12	12 Alphanumeric (It is unique no for identification of Track asset in TMS)
5	Chainage in KM	4	1000 Km will be written as 1000
6	Chainage in m	5	26.5 meter will be written as 00265

Example of data storage format in RFID TAG:-

DE23123456789999003005005

D	Version No	Default currently
E	Zonal Railway	Northern railway
23	Railway Division	Northern railway Lucknow Division
123456789999	Track asset	Level crossing No 23 A
0030	Chainage in Km	Km 30
05005	Chainage in Meter	Meter 500.5

Annexure –II/3

SL No	Zone	Code
1	Central Railway	A
2	Eastern Railway	B
3	East Central Railway	C
4	East Coast Railway	D
5	Northern Railway	E
6	North Central Railway	F
7	North Eastern Railway	G
8	North Western Railway	H
9	Northeast Frontier Railway	I
10	Southern Railway	J
11	South Central Railway	K
12	South East Central Railway	L
13	South Eastern Railway	M
14	South Western Railway	N
15	Western Railway	P
17	Metro Railway	R
18	Konkan Railways	S

Annexure –II/4

SL No	Zone	Division	Code
1	Central Railway	Mumbai Division	01
		Bhusawal Division	02
		Nagpur Division	03
		Solapur Division	04
		Pune Division	05
2	Eastern Railway	Howrah	06
		Malda	07
		Sealdah	08
		Asansol	09
3	East Central Railway	Sonpur	10
		Danapur	11
		Dhanbad	12
		Mughalsarai	13
		Samastipur	14
4	East Coast Railway	Sambalpur	15
		Khurda Road	16
		Waltair	17
5	Konkan Railways	KonanRailway	18
6	Northern Railway	Ambala	19
		Delhi	20
		Firozpur	21
		Moradabad	22
		Lucknow	23
7	North Central Railway	Allahabad	24
		Jhansi	25
		Agra	26
8	North Eastern Railway	Varanasi	27
		Lucknow	28
		Izatnagar	29
9	North Western Railway	Jodhpur	30
		Bikaner	31
		Jaipur	32
		Ajmer	33
10	Northeast Frontier Railway	Katihar	34
		Alipurduar	35
		Lumding	36
		Rangiya	37
		Tinsukia	38
11	Southern Railway	Chennai	39
		Madurai	40
		Palakkad	41
		Thiruvananthapuram	42
		Tiruchirappalli	43

		Salem	44
12	South Central Railway	Hyderabad	45
		Secunderabad	46
		Vijayawada	47
		Guntakal	48
		Guntur	49
		Nanded	50
13	South East Central Railway	Bilaspur	51
		Nagpur	52
		Raipur	53
14	South Eastern Railway	Adra	54
		Chakradharpur	55
		Kharagpur	56
		Ranchi	57
15	South Western Railway	Hubballi	58
		Mysuru	59
		Bengaluru	60
16	Western Railway	Vadodara	61
		Ahmedabad	62
		Rajkot	63
		Bhavnagar	64
		Ratlam	65
		Mumbai	66
17	West Central Railway	Jabalpur	67
		Kota	68
		Bhopal	69
18	Metro Railway	Kolkatta	70

Annexure –III/1-2

TGMS Ver 1.0,Route Information Route No: 0151 Reversed
USER 1
USER 2
South Central
SPQ-WRE
16,1,
0198,0998,1,
0199,0162,10,
0199,0480,2,
0199,0690,24,
0199,0748,25,
0199,0843,11,
0199,1001,1,
0200,0042,10,
0200,0827,11,
0200,0850,26,
0200,0897,1,
0201,0135,2,
0201,0162,10,
0201,0279,26,
0201,0340,25,
0201,0893,11,
0201,0408,10,
0201,0578,2,
0201,0603,11,
0201,0605,47,
0201,0684,40,
0201,0684,40,
0201,0725,40,
0201,0800,47,
0201,0981,1,
0202,0000,2,
0202,0142,2,
0202,0432,26,
0202,0485,26,
0202,0550,10,
0202,0598,47,
0202,0661,40,
0202,0702,40,
0202,0702,40,

Annexure –III/2

NORTH CENTRAL, ALD, MGS-GZB, UP, DI., TROLLEY2, FAST, 1415-1418
1415,23,2,28°32'01.806"N,077°32'28.962"E,
1415,26,11,28°32'01.932"N,077°32'28.848"E,
1415,67,2,28°32'02.952"N,077°32'27.978"E,
1415,112,2,28°32'04.128"N,077°32'26.982"E,
1415,133,47,28°32'04.632"N,077°32'26.448"E,
1415,136,2,28°32'04.704"N,077°32'26.382"E,
1415,158,40,28°32'05.274"N,077°32'25.824"E,
1415,176,2,28°32'05.706"N,077°32'25.422"E,
1415,230,2,28°32'07.062"N,077°32'24.144"E,
1415,244,47,28°32'07.404"N,077°32'23.820"E,
1415,252,10,28°32'07.608"N,077°32'23.604"E,
1415,285,2,28°32'08.394"N,077°32'22.878"E,
1415,343,2,28°32'09.936"N,077°32'21.534"E,
1415,407,2,28°32'11.544"N,077°32'20.076"E,
1415,465,2,28°32'13.074"N,077°32'18.846"E,
1415,483,11,28°32'13.500"N,077°32'18.426"E,
1415,519,2,28°32'14.448"N,077°32'17.676"E,
1415,574,2,28°32'15.888"N,077°32'16.452"E,
1415,628,2,28°32'17.256"N,077°32'15.210"E,
1415,635,88,28°32'17.472"N,077°32'15.048"E,
1415,678,2,28°32'18.516"N,077°32'14.148"E,
1415,736,2,28°32'20.022"N,077°32'12.828"E,
1415,800,2,28°32'21.732"N,077°32'11.442"E,
1415,809,10,28°32'22.020"N,077°32'11.232"E,
1415,863,2,28°32'23.388"N,077°32'10.170"E,
1415,908,47,28°32'24.546"N,077°32'09.240"E,
1415,922,2,28°32'24.906"N,077°32'08.964"E,
1415,946,89,28°32'25.536"N,077°32'08.424"E,
1415,962,4,28°32'26.016"N,077°32'08.112"E,
1415,970,26,28°32'26.160"N,077°32'07.980"E,
1415,984,2,28°32'26.544"N,077°32'07.650"E,
1415,997,1,28°32'26.934"N,077°32'07.266"E,
1416,10,11,28°32'27.246"N,077°32'07.080"E,
1416,21,2,28°32'27.522"N,077°32'06.834"E,
1416,71,2,28°32'28.794"N,077°32'05.754"E,
1416,89,40,28°32'29.316"N,077°32'05.400"E,
1416,115,2,28°32'30.042"N,077°32'04.788"E,
1416,145,2,28°32'30.804"N,077°32'04.146"E,
1416,161,40,28°32'31.212"N,077°32'03.864"E,
1416,197,2,28°32'32.184"N,077°32'03.102"E,
1416,218,40,28°32'32.796"N,077°32'02.652"E,
1416,220,10,28°32'32.838"N,077°32'02.622"E,
1416,254,2,28°32'33.714"N,077°32'01.920"E,
1416,270,47,28°32'34.140"N,077°32'01.650"E,
1416,314,2,28°32'35.328"N,077°32'00.714"E,
1416,377,2,28°32'36.996"N,077°31'59.328"E,
1416,437,2,28°32'38.544"N,077°31'58.062"E,
1416,460,47,28°32'39.132"N,077°31'57.546"E,
1416,472,11,28°32'39.450"N,077°31'57.300"E,
1416,477,2,28°32'39.564"N,077°31'57.204"E,
1416,500,40,28°32'40.140"N,077°31'56.634"E,

Annexure –IV/1-5

KILOMETER WISE SD and RMS Report					
DATE: 20.05.2018	Railway- NCR	Division - ALD	Section: CNB - ALD	Line - UP	Filter Range 1.0m-3.0m

KM: FROM 0121 To 0122

LOCATION	AXLE BOX-LEFT				AXLE BOX- RIGHT			
	SD-V	SD-L	RMS-V	RMS-L	SD-V	SD-L	RMS-V	RMS-L
BLK-1								
BLK-2								
BLK-3								
BLK-4								
BLK-5								
BLK-6								
BLK-7								
Kilometre								
Kilometer length								

KM: FROM 0122 To 0123

LOCATION	AXLE BOX-LEFT				AXLE BOX- RIGHT			
	SD-V	SD-L	RMS-V	RMS-L	SD-V	SD-L	RMS-V	RMS-L
BLK-1								
BLK-2								
BLK-3								
BLK-4								
BLK-5								
BLK-6								
BLK-7								
Kilometre								
Kilometer length								

Annexure –IV/2

Exception Report of Acceleration above Level -1						
DATE: 20.05.2018	Railway- NCR	Division- ALD	Section: CNB – ALD	Line- UP	Filter Range 1.0m – 3.0m	
KM: FROM 0121 To 122						
AXLE BOX- LEFT – VERTICAL	LEVEL – 1(1.0g) Peak/Metre	1.12/124	1.23/421			
AXLEBOX – RIGHT- VERTICAL	Level- 1(1.0g) Peak/Metre	1.34/231	1.45/512			
AXLE BOX- LEFT – LATERAL	LEVEL – 1(1.0g) Peak/Metre	1.12/124	1.23/421			
AXLEBOX – RIGHT- LATERAL	Level- 1(1.0g) Peak/Metre	1.52/124	1.63/421			

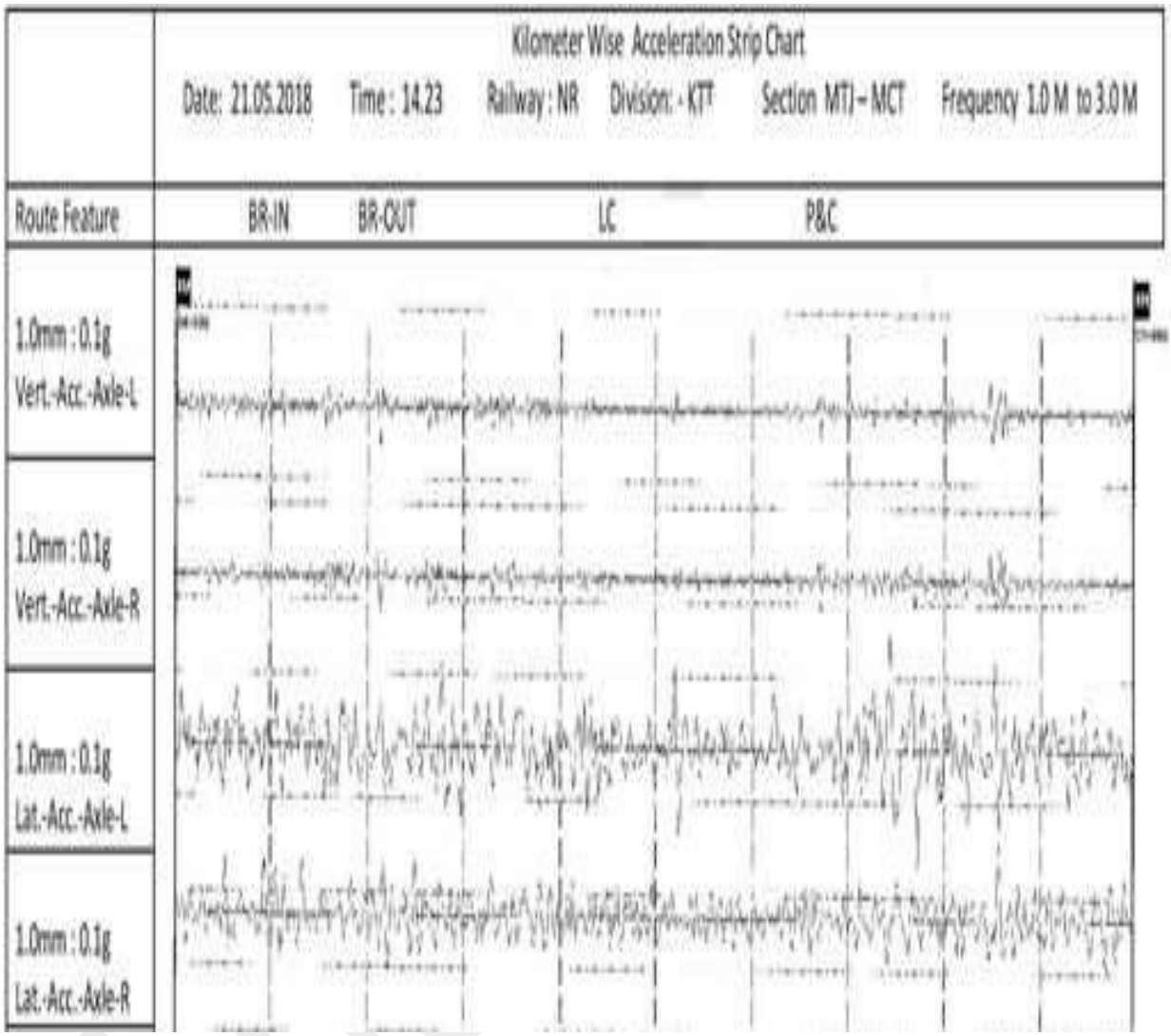
Annexure –IV/3

Exception Report of Acceleration above Level -2						
DATE: 20.05.2018	Railway- NCR	Division- ALD	Section: CNB – ALD	Line- UP	Filter Range 1.0m – 3.0m	
KM: FROM 0121 To 122						
AXLE BOX- LEFT – VERTICAL	LEVEL – 2 (2.0g) Peak/Metre	2.12/124	2.23/421			
AXLEBOX – RIGHT- VERTICAL	Level- 2 (2.0g) Peak/Metre	2.34/231	2.45/512			
AXLE BOX- LEFT – LATERAL	LEVEL – 2 (2.0g) Peak/Metre	2.12/124	2.23/421			
AXLEBOX – RIGHT- LATERAL	Level- 2 (2.0g) Peak/Metre	2.52/124	2.63/421			

Annexure –IV/4

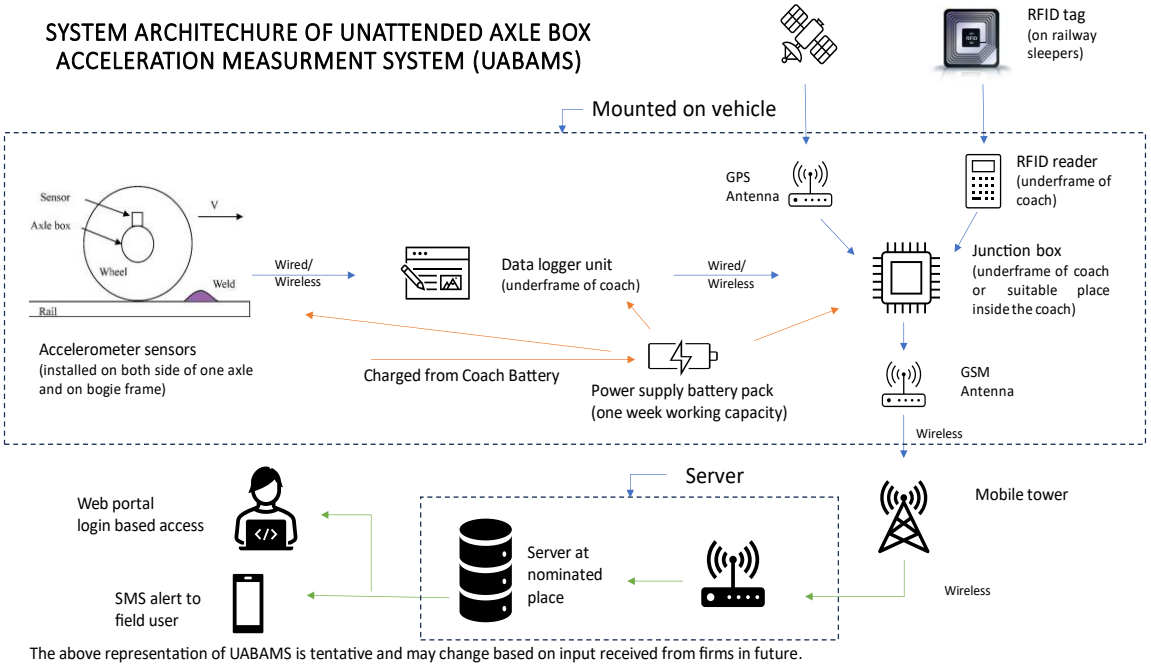
Exception Report of Acceleration above Level -3						
DATE: 20.05.2018	Railway- NCR	Division- ALD	Section: CNB – ALD	Line- UP	Filter Range 1.0m – 3.0m	
KM: FROM 0121 To 122						
AXLE BOX- LEFT – VERTICAL	LEVEL – 3 (2.5g) Peak/Metre	2.64/124	2.79/421			
AXLEBOX – RIGHT- VERTICAL	Level- 3 (2.5g) Peak/Metre	2.73/231	2.85/512			
AXLE BOX- LEFT – LATERAL	LEVEL – 3 (2.5g) Peak/Metre	2.72/124	2.96/421			
AXLEBOX – RIGHT- LATERAL	Level- 3 (2.5g) Peak/Metre	2.66/124	2.87/421			

Annexure –IV/5



Annexure – V

System Architechture of UABAMS



The above representation of UABAMS is tentative and may change based on input received from firms in future.