IP BASED VIDEO SURVEILLANCE SYSTEM (VSS) FOR 3-PHASE MEMU RAKES

1.0 The Video Surveillance System (VSS) for 3-Phase MEMU rakes shall comprise of an IP based close circuit television (CCTV) system network, surveillance cameras, routers and cables, monitors and other accessories as per RDSO Telecom Directorate Specification no. RDSO/SPN/TC/106/2025 (Version No. 3.0).

The following shall also be applicable for Video Surveillance System (VSS) as applicable in MEMU rake:

Addendum/Corr. To spec. no. RDSO/PE/SPEC/EMU/0163-2022 Rev-3.	Clause no. of spec. no. RDSO/PE/SPEC/EMU/0163-2022 Rev-3
Addendum/Corr. No. 1	4.26
Addendum/Corr. No. 2 **Annexure VI-D added to RDSO/PE/SPEC/EMU/0163-2022 Rev-3.** In this annexure the changes/additions in RDSO Telecom Directorate Specification no. RDSO/SPN/TC/106/2022 (Version No. 2.1 or latest) are incorporated in clause no. 2.2, 2.4, 2.10, 2.11, 2.12, 2.13, 2.14 & 2.15 for EMU/MEMU type rakes.	4.19.1
Addendum/Corr. No. 3	4.9.9, 4.26

2.0 Scope of Supply:

Scope of supply covers design, development, supply, installation and commissioning of complete set of Video Surveillance System (VSS) in 3-phase MEMU coaches. System shall broadly comprise of the following:

S. No.	Item description	QPC	
		DMC	TC
1	Full HD Fixed Dome/Wedge type IP Colour Camera:		
	i) IP saloon Cameras	08 Nos.	08 Nos.
	ii) Front view Cameras	01 No.	---
	iii) Platform view Cameras	02 Nos.	---
	iv) Panto view camera	01 No.	
	v) Cab Camera with inbuilt microphone ##	02 Nos.	---
2	i) Mobile Network Video Recorder/ Video Recording Unit (VRU) with SSD storage and associated software.	As Required **(#)**	As Required

	(as per clause A4.2.2, A4.2.3, A4.2.7 of RDSO/SPN/TC/106/2025 version 3.0 for additional requirement for MEMU coaches.)		
	ii) Managed switch adequate no. of PoE/ non-PoE port (as per clause A4.2.2 of RDSO/SPN/TC/106/2025 version 3.0	01 set in each coach	
	iii) Built-in or external Wi-Fi access point for Mobile NVR to transfer and append the Video data to server at Cloud/Data Centre for the data if demanded as per clause 4.3.14 of specification no. RDSO/SPN/TC/106/2025 version 3.0	As required	
	iv) Pre-installed face image cropping tool shall run on CCTV cameras installed at entry/exit doors of each coach. Face image cropping tool on the camera and/or video recording unit Mobile NVR shall identify the faces of person from the live feed and cropped image should meet the requirement of FRS (whenever FRS is applicable). VMS shall have provision to identify unique faces in a given duration of time; the time duration shall be configurable. The cropped face image with the metadata shall be stored in M-NVR and shall be downloaded for sending to Face matching Server. As per clause 4.3.19 of specification no. RDSO/SPN/TC/106/2025 version 3.0	As required	
3	HMI Screen (10.1 inch) shall be provided in the Driver Desk as per OGA drawing no. SKED-974 and as per clause A4.2.4 (OGA to be got approved before commencement of supply)	01 No.	---
4	Redundant high speed Gigabit IP backbone (for making ring network) and accessories through an independent separate network. ###	As Required	As Required

Note: In addition to above, any other additional requirement for compliance with the specification no. RDSO/SPN/TC/106/2025 version 3.0 shall be in the scope of supply.

(#) The enclosure for VRU/Mobile NVR shall have ingress protection IP-54 rating as per IEC 60529. To familiarize with the interface requirements in DMC and TC, the supplier may visit and physically assess the existing 3-phase MEMU rakes under manufacture at RCF. Software Development Kit (SDK) or API of all Hardware/Software shall be shared with the purchaser for testing purposes, as and when required.

(##) Clause no. A4.2.10 of specification no. RDSO/SPN/TC/106/2025 version 3.0 shall not be applicable. Audio & video recording of driver cab cameras shall be recorded in VRU/Mobile NVR.

(###)Clause no. A4.2.1 of specification no. RDSO/SPN/TC/106/2025 version 3.0 shall not be applicable i.e. VSS is not required to be interfaced with TCMS and there shall be an independent separate network for VSS which shall comprise of CAT 7 or better (100 ohm or latest) for Gigabit IP backbone application and CAT 6 cables for intra-coach application compliant to clause no. 4.4.1 of RDSO specification no. RDSO/SPN/TC/106/2025 version 3.0. Inter-coach connectivity shall be through existing Inter vehicular couplers which includes spare data cables for CCTV and shall be in scope of RCF.

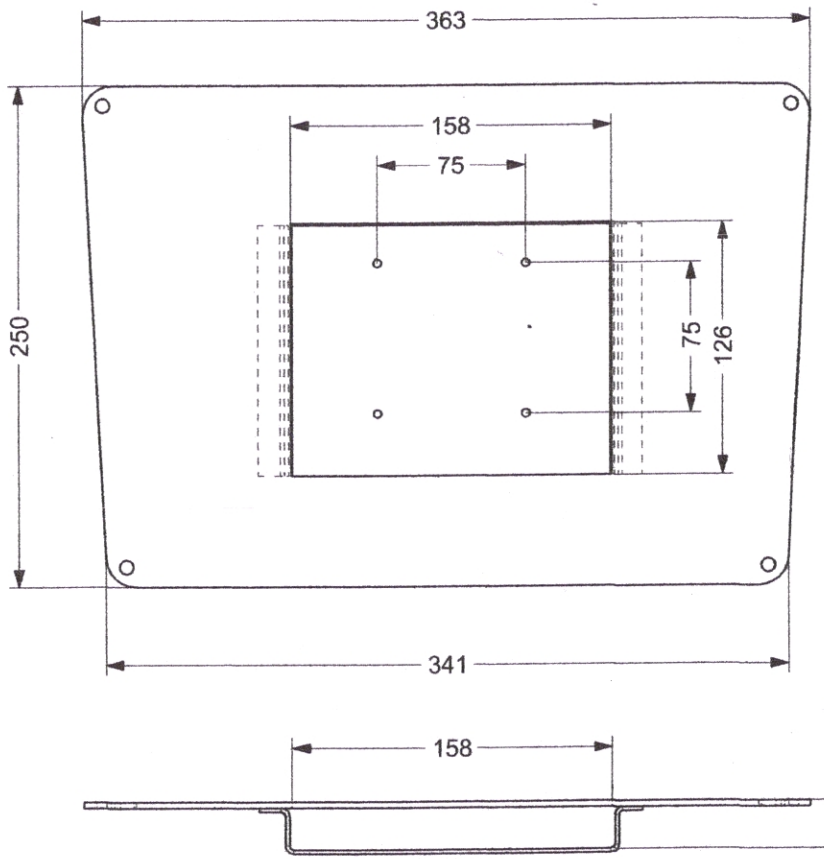
3.0 Audit and Testing:

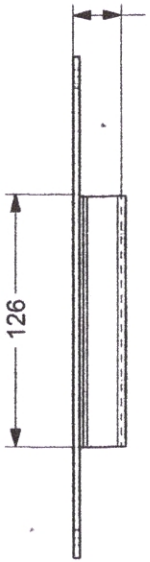
The successful Bidder shall ensure the security of entire CCTV system which shall be subjected to Security Audit/Testing as per clause 3.13 of specification no. RDSO/SPN/TC/106/2025 version 3.0 as follows:-

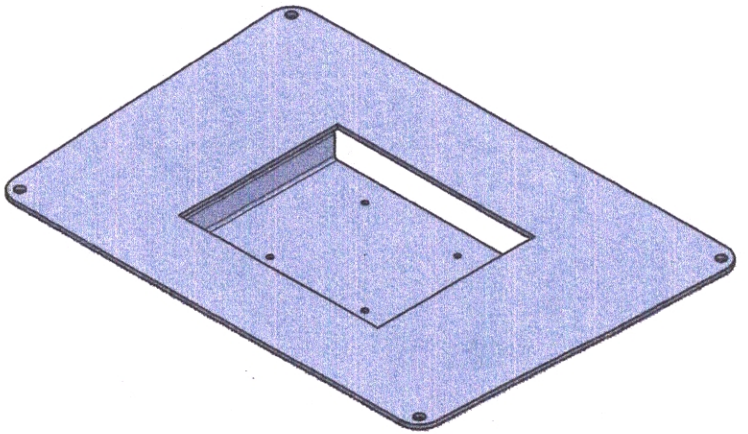
"To ensure security of IP based VSS for Rolling Stock of Indian Railways (Camera & Software) from vulnerabilities & breaches and discourage false undertaking from OEMs, security auditing and testing of equipment including source code of camera and software shall be carried out from STQC (Ministry of Electronics & Information Technology) only.

In case any security breach is found in the system at any stage, immediate strict penal action is to be initiated by the purchaser."

ALT.NO	ALT.DATE	ZONE	ALTERATIONS	AUTHORITY
NIL	NIL	NIL	NIL	NIL







WELD LENGTH	ITEM	DESCRIPTION & DIMENSIONS	QPASSLY	DETAIL DRG	MATL. & SPEC.	REMARKS
NIL M			NIL	NIL	NIL	NIL
	GROUP	ELECTRICAL	SUPERSEDES: NIL			
WEIGHT	FILE					
NIL KG						
S.AREA		CCTV DISPLAY MOUNTING BRACKET				
NIL M2		FOR 3-PHASE MEMU				
LENGTH / DIA						
NIL M		RAIL COACH FACTORY, KAPURTHALA				
WIDTH / THICK		रेल कोच फैक्टरी कपूरथला IRS				
NIL M						
HEIGHT						
NIL M		DY.CEE/D&D				

SCALE	SSE/ED
	GND
	DRN

REF.DRG.NO. NIL

PL NO. NIL

DRG.NO. SKED-974

ALT. NIL SIZE A3 SHEET 1/1

DETAIL DRGS STARTING WITH "LI" ARE INTERNAL REFERENCE LISTS ONLY AND ARE NOT FOR ISSUE.

THIS IS A COMPUTER GENERATED DRAWING. ANY MANUAL ALTERATION SHALL AUTOMATICALLY RENDER IT INVALID.

FOR UNTOLERANCED DIMENSIONS REFER MDG0008 | DATE OF FIRST ISSUE | 11/10/2024

Corrigendum - 01 to EDML-252, Rev.-Nil

RDSO has issued specification no. RDSO/SPN/TC/106/2025 (Version 3.1) for "IP Based Video Surveillance System for Rolling Stock of Indian Railway". Railway Board has advised that all newly manufactured MEMU shall be equipped with RDSO specification no. RDSO/SPN/TC/106/2025 (Version 3.1). Therefore, this Corrigendum is issued to EDML-252 rev. nil for the Video Surveillance System (VSS) for 3-Phase MEMU rake and wherever the specification no. RDSO/SPN/TC/106/2025 (Version 3.0) appears shall be read as RDSO/SPN/TC/106/2025 (Version 3.1).

Clause no.-2.0 Scope of Supply:

SN	Item Description	Exiting QPC		Revised QPC	
		DMC	TC	DMC	TC
1	Full HD fixed Dome/Wedge type IP Colour Camera				
	i) IP saloon Cameras	08 Nos.	08 Nos.	04 Nos.	04 Nos.
	v) Cab Camera with inbuilt microphone ##	02 Nos.	---	01 No.	---

Note: The quantity of all other items will remain the same.

EDML-252	Nil	1	08.07.2025			1 of 1
Spec.	Rev.	Corrigendum	Date	SSE/CAD	Dy.CEE/D&D	Page

GOVERNMENT OF INDIA
MINISTRY OF RAILWAYS

RESEARCH DESIGNS & STANDARDS ORGANISATION
MANAK NAGAR, LUCKNOW – 226011

RDSO/SPN/TC/106/2025, Version 3.1

SPECIFICATION

FOR

IP BASED VIDEO SURVEILLANCE SYSTEM FOR ROLLING STOCK OF INDIAN RAILWAYS

ISSUED BY
SIGNAL & TELECOM DIRECTORATE

I. Amendment History:

S. No.	Amendment Date	Version	Reason for Amendment
1	15th March 2018	0.0	**First Issue** RDSO/SPN/TC/106/2018, Revision 0.0 was prepared by RDSO, Lucknow as per Railway Board's letter no. 2017/Tele/3(1)/1/CCTV, dated 07/11/2017
2	24th April 2019	Rev. 1.0	**All Pages** RDSO/SPN/TC/106/2019, Revision 1.0 has been prepared by RDSO, Lucknow based on comments received from RAILTEL through Railway Board and Industries
3	1st January 2020	Amdt. 1.0	**Required/ Relative Pages** Amendment 1.0 to the specification RDSO/SPN/TC/106/2019, Revision 1.0 was prepared by RDSO, Lucknow to correct minor typographical errors in the specification
4	25th October 2022	Ver. 2.0	**All Pages** RDSO/SPN/TC/106/2022, Version 2.0 has been prepared by RDSO, Lucknow as per DG/RDSO letter No. DG/Misc. dated 04.12.2019 and 10.06.2020, Indian Railways D.B. Task ID: 3857, dtd. 04.12.2020, Railway Board's Committee Report on Modalities to Monitor, Record, Retrieval and Data Transmission On Real Time Basis from the CCTV Cameras being Provided In Train Coaches, dtd. 24.06.2021, IG/HQ/Railway Board's letter no. 2022/Sec(Crime)/FRS based CCTV, Dated: 23.06.2022, RDSO/SPN/TC/65/ 2021, version 6.0 and comments received from industry.
5	3rd November 2022	Ver. 2.1	**Required/ Relative Pages** Correction in Clause Numbering only.

S. No.	Amendment Date	Version	Reason for Amendment
6	30th January 2025	Ver. 3.0	**All Pages** The specification has been revised & prepared in compliance to Railway Board's letter no. 2025/Dev.Cell/ICC1/1, dated 22.01.2025.
7	04th June 2025	Ver. 3.1	**Required/ Relative Pages** The specification has been amended and prepared in compliance to Railway Board's letter no. 2025/Dev.Cell/ICC1/1 (3485651), dated 04.06.2025.

II. DOCUMENT CONTROL SHEET

DESIGNATION	ORGANIZATION	FUNCTION	LEVEL
SSE/Telecom	RDSO	Member	Assist / Prepare
ADE/Telecom	RDSO	Member	Assist / Prepare, Check
Director/Telecom-I	RDSO	Member	Prepare & Check
Director/ SS/Carriage	RDSO	Member	Prepare & Check
Director/ Motive Power	RDSO	Member	Prepare & Check
Director Std. Electrical/System	RDSO	Member	Prepare & Check
Executive Director/ EMU	RDSO	Member	Prepare & Check
Executive Director/ Telecom-I	RDSO	Member Secretary	Prepare, Review, Issue
Pr. Executive Director/S&T	RDSO	Approving Authority	Approve

III. TABLE OF CONTENTS

Specification of IP based Video Surveillance System for Rolling Stock of Indian Railways

1.0 OBJECTIVES:

This specification has been prepared in compliance to Railway Board's letter no. 2025/Dev.Cell/ICC1/1, dated 22.01.2025. Main objectives of this specification is to provide CCTV camera on the Rolling Stock i.e. Coaches, Locomotives, all Self-Propelled Vehicles, Trainset, EMU, DMU, MEMU and Kolkata Metro for recording the activities inside as well as outside the Rolling Stock for post event analysis.

The objective of camera / audio recording inside coach / loco / cab is to provide data to understand the sequence of events leading to an incidence and identify operational issues as well as storing of cropped Face Image data in coaches for development of Data Analytics like Facial Recognition System, etc. for security purpose.

The objective of outdoor camera recording is for post event analysis of events like obstruction on track or OHE, Trespassing, Miscreant Activity on Track / LC Gate, CRO, HRO, etc. and also events like foreign objects like cloth, tree branch, kite, etc. on OHE. These cameras are not capable for identification of defects / objects.

Maintenance requirement such as defect identification and measurement of parameters related to Track & OHE are not considered as they require specialized camera / equipment & software. Generally, such camera / equipment is required to be provided on specific vehicle being used for the maintenance & inspection purpose. Development of such equipment is being undertaken by respective directorate.

2.0 SCOPE:

The Specification covers general requirement of the system and technical specification of IP based Fixed Dome/Wedge IP colour Camera, Mobile NVR, Video Management Software (VMS) and Microphones, etc. for Surveillance in Rolling Stock of Indian Railway.

3.0 GENERAL REQUIREMENTS:

3.1 The Video Surveillance System (VSS) for Rolling Stock for IR shall be end to end IP (Internet Protocol) based.

3.2 The Video Surveillance system shall be based on non-proprietary open architecture and API/SDK of all Hardware is to be shared with the purchaser so that the System Software can work and integrate with any make of IT hardware.

3.3 Industrial grade Vibration and Shock Proof Solid State Drive (SSD) shall be used for data storage and can be un-mountable from NVR as pluggable device

for offline downloading the Data. There shall be sufficient memory to Store minimum 30 days data on FIFO (First in First Out) basis.

3.4 The Video data of Cameras shall be stored in the Mobile NVR for at least 30 days at minimum 25 FPS with Full HD resolution with H.265 or higher Video Compression.

3.5 Each Camera shall be enabled with tampering / blinding alarms using camera analytics or VMS. Tampering Alarm data of Cameras shall be stored in the Mobile NVR for at least 30 days

3.6 Mobile NVR should be provided with inbuilt GPS / Indian Regional Navigation Satellite System (IRNSS) module for real-time location, etc. There shall be provision of date and timestamps which shall be synchronized with GPS/IRNSS.

3.7 The Mobile NVR shall have self-diagnostics feature. It shall be possible to access Cameras through Mobile NVR for diagnostic and management purpose locally or from remote location.

3.8 The indication of health of Mobile NVR, each channel and storage device shall be displayed in Mobile NVR. Each health diagnostic alert shall be stored as an event and shall be possible to download whenever required.

3.9 Mobile NVR shall provide power to all cameras & microphones through PoE. There shall be no need for external power source for cameras & microphones.

3.10 Profile 'S' defines interoperability between Video Management Software / M-NVR and Camera.

The System i.e. Mobile NVR, IP cameras and VMS shall be compliant to global standards ONVIF Profile 'S' for the interface of network video product (ONVIF – Open Network Video Interface Forum). The quoted camera models should appear on the ONVIF conformant products under Device List & quoted Video Management Software/Mobile NVR should appear under conformant Client List on the ONVIF website and a confirmation certificate for the offered models should be available at the time of supply. It should be confirmed from ONVIF Website at the time of supply while offered for inspection.

3.11 Mobile NVR shall be provided with unique digital identification number. This shall be used as key identifier for Mobile NVR retrieving data. It shall be possible to change identification number of Mobile NVR as per requirement.

3.12 System should ensure that once recorded, the audio & video cannot be tempered / altered / deleted; ensuring the audit trail is intact. The video recording shall have provision of date & time, location, etc. for evidential purposes.

3.13 To ensure security of IP based VSS for Rolling Stock of Indian Railways (Camera & Software) from vulnerabilities & breaches and discourage false undertaking from OEMs, security auditing and testing of equipment including source code of camera and software shall be carried out from STQC (Ministry of Electronics & Information Technology) only.

In case any security breach is found in the system at any stage, immediate strict penal action is to be initiated by the purchaser.

3.14 Declarations to be submitted by OEM:

OEMs must submit a declaration certificate regarding their genuinity, have their own manufacturing setups and IPR for the hardware(s)/software(s), and shall not have 3rd party manufacturing from any company blacklisted in India or abroad (due to proven backdoor access and data vulnerability) or any company sharing land border with India. The Intellectual Property Rights (IPR) of all manufactured final product and source code of all software including camera firmware etc. should not reside in countries sharing land borders with India, until unless specifically allowed by the Government of India and is registered with the Competent Authority of Government of India. Proof of IPR & source code residing in which country and requisite permission & registration with Competent Authority of Govt. of India, as applicable to comply with the above, shall be provided by the OEMs. The purchaser should ensure that latest Public Procurement Policy & other related orders issued by Government of India are followed. In case any breach or false declaration is found at any stage, immediate strict penal action is to be initiated by the purchaser.

3.15 Mean Time Between Failure (MTBF) calculated at 40°C for each type of camera should not be less than 1,00,000 hours for which OEM shall submit complete and detailed test reports issued from Govt. / NABL Accredited Test Labs like Centre for Reliability (CFR), Chennai under STQC Directorate, etc.

3.16 The power available in the Locomotives & Coach is 72V & 110V DC / 110V AC (nominal). A Suitable Power Supply Unit conforming to BIS/ EN 50155/ IEC 60571 (For Temperature, Humidity, Vibration and EMI & EMC) and BIS (IS 13252 : Part 1: 2010 or latest) as applicable for Safety for Rolling Stock application shall be provided by the supplier to operate Mobile NVR. The power supply unit can be inbuilt or external to Mobile NVR.

3.17 There shall be provision of a rugged Hand-Held Terminal (HHT)/Tablet along with min. 8TB External SSD for retrieving the data from Mobile NVRs with proper user authentication. It shall be universal and shall be compatible with different make of Mobile NVRs.

The HHT/Tablet shall be able to display the health of Mobile NVR and IP Cameras and other connected devices, when plugged in with Mobile NVR.

SN	Parameter	Minimum Requirement
1.	Form Factor	Rugged and Hand-Held

SN	Parameter	Minimum Requirement
2.	Processor	2 GHz Quad core/Octa core processor or better
3.	Screen	Capacitive Touch Screen (minimum 8 inches or above)
4.	Display Resolution	1920 x 1080 pixels
5.	Brightness	350 NITS or better
6.	RAM Size	4 GB or more
7.	Internal Storage Capacity	128 GB or more
8.	Micro SD Card Support	Storage upgradable up to 512 GB or Higher
9.	Battery Capacity	4000mAH or better
10.	Compatible to connect	With USB port of M-NVR along with required accessories

Note: 01 (one) no. of rugged HHT/Tablet with min. 8TB external SSD shall be provided for every 50 Coaches & for every 50 Locos to the user per allotted Coaching Depot / Workshop / Loco Shed or as specified by the purchaser.

3.18 Mobile NVR, Power Supply unit and other accessories shall be housed in concealed enclosure with suitable Ingress Protection for dust and water by providing gasket & sealing of cable entry / exit along with suitable lock and key arrangement or as specified by the purchaser. Suitable anti-corrosion measures shall also be ensured.

4.0 TECHNICAL REQUIREMENTS:

The technical requirements of different components shall be as below:

4.1 Full HD Fixed Dome/Wedge type IP Colour Camera:

The camera shall have the following minimum specifications or otherwise as specified in respective annexures or otherwise as specified by the purchaser:

SN	Parameter	:	Minimum Specification
i.	Image Sensor	:	1/ 2.8" or larger, Progressive scan, CMOS Sensor
ii.	Streaming capability and Video Compression	:	Minimum three (3) streams @ H.265 or higher compression
	Audio Compression		G.711/G.722/G.726/AAC or similar
iii.	Resolution and Frame Rate	:	• Full HD (1920x1080) resolution @ 25 frames per second (FPS) with H.265 or higher compression on one stream. • FHD / HD / D1@ 25 FPS with H.265 or higher compression on 2nd stream. • VGA or CIF or QVGA or QCIF @ 15 FPS with H.265 or higher compression on 3rd stream.
iv.	Minimum Illumination	:	0.05 Lux (Coloured)

SN	Parameter	:	Minimum Specification
v.	Lens	:	Focal Length 2.8 mm or larger, IR corrected, 1 m minimum object distance, Fixed IRIS Control suitable for Full HD Dome/Wedge type IP Colour Camera.
vi.	Infra-Red	:	Built-in Infra-Red Illuminator with range 30 m or more
vii.	Wide Dynamic Range	:	≥ 120 dB
viii.	Network Connectivity & PoE	:	Ethernet, 10/100 Base T, IEEE 802.3af/at PoE compliant with M12/M23 connector
ix.	Casting Streaming	:	Unicast and Multicast streams
x.	Bit Rate	:	Shall support Variable Bit Rate (VBR) on individual (Single) stream with H.265 or higher Video Compression. The camera shall also support Constant Bit Rate (CBR).
xi.	Discovery Interface	:	OEM interface to detect the camera automatically and configure network settings
xii.	Network Protocols	:	Suitable and required network protocol stack to work Camera in TCP/IP based Ethernet network environment. (As required for system working)
xiii.	Web Server	:	Internal Web server required with embedded operating system.
xiv.	Activity controlled video recording	:	During periods of negligible motion, the recording bits rate shall drop and when motion occurs, the recording bit rate shall return to normal without any perceptible delay.
xv.	MAC Address	:	The MAC address of the IP cameras must be registered in the name of OEM supplying the Cameras.
xvi.	MTBF	:	Mean Time Between Failure (MTBF) calculated at 40°C should not be less than 1,00,000 hours.
xvii.	Power Consumption (PoE)	:	Should be less than 10 Watt.
xviii.	Operating Temperature	:	As per EN 50155 category OT3
xix.	Humidity	:	95% RH, Non-condensing or as specified by the purchaser
xx.	Defogger Feature	:	Should be available
xxi.	Ingress Protection	:	IP 65 or higher for indoor cameras IP 67 or higher for outdoor cameras
xxii.	Vandal Proof Casing	:	IK10 or higher

SN	Parameter	:	Minimum Specification
xxiii.	Regulatory Approvals/ Certifications	:	a) EN 50155 / IEC 60571 or equivalent BIS for Rolling Stock application for Temperature, Humidity, Vibration, EMI & EMC. b) BIS (IS-13252 : Part 1 : 2010 or latest) for Equipment Safety. c) IEC 60068-2-10 or latest for Mould Growth Test of PCB. d) ONVIF Profile 'S' for the interface of network video product (ONVIF – Open Network Video Interface Forum). **Note:** For BIS/EN/IEC test certificate to be provided from internationally reputed and accredited test Labs/agencies or NABL/NABCB accredited Labs.
xxiv.	Security Verification Certification	:	The Full HD Fixed Dome/Wedge type IP Colour Camera shall have security features which can be deployed meeting all the parameters applicable to cameras with relevant and equivalent safeguards as per Essential Requirements (ERs) notified for CCTV Cameras in Gazette of India dated 07.03.2024 or latest as issued by MeitY. Note: The Security Verification Certifications are to be provided from STQC (Ministry of Electronics & Information Technology) only.

4.2 Mobile Network Video Recorder (Mobile NVR):

The Mobile Network Video Recorder shall have the following minimum specifications or otherwise as specified by the purchaser:

SN	Parameter	:	Minimum Specification
i.	Channels	:	Minimum requirement: 08 nos.: where cameras including microphones are 08 or less. 16 nos.: where more than 08 cameras including microphones.
ii.	Operating System	:	Embedded Windows or Linux
iii.	Camera type which is required to be supported	:	IP 2 & 4 Mega Pixel Full HD (1920x1080) or higher
iv.	Recording Resolution and Frame Rate	:	Full HD (1920x1080) @ 25 FPS (indoor camera) & @ 45 FPS (outdoor camera) or higher

SN	Parameter	:	Minimum Specification
v.	Supported Image Resolution	:	SD, HD and Full HD resolution
vi.	Compression		
	a)Video	:	H.265 or higher
	b) Audio	:	G.711/G.722/G.726/AAC or similar
vii.	Recording	:	The Mobile-NVR should be able to record all channels simultaneously at FHD resolution.
viii.	Storage for recording and other software	:	Data storage for minimum 30 days. SSD of minimum Capacity or higher as given below: Min. 4TB with 08 Channel M-NVR. Min. 8TB with 16 Channel M-NVR.
ix.	Network Protocols	:	Suitable and required network protocol stack to work Camera in TCP/IP based Ethernet network environment. (As required for system working)
x.	Discovery Interface	:	OEM interface to detect the camera automatically and configure network settings
xi.	GPS / Indian Regional Navigation Satellite System (IRNSS) Module	:	Inbuilt GPS / Indian Regional Navigation Satellite System (IRNSS) Module.
xii.	Mobile Communication	:	Inbuilt LTE Mobile communication (5G auto fallback to 4G) interface with standard SIM Card Slot. Note: e-SIM in place of standard SIM Card slot shall also be acceptable if full functionality is achieved.
xiii.	Wi-fi	:	Inbuilt Wi-fi, IEEE 802.11 b/g/n or 802.11 ac or better with Antenna
xiv.	10/100 Base T Ethernet Interface	:	Inbuilt Ethernet interface – as per channel requirement for connecting cameras - 10/100 Base T, IEEE 802.3af/at compliant PoE with M12/M23 connector
xv.	1 Gbps Ethernet Interface	:	Minimum 02 nos. with M12/M23 connector
xvi.	Video Output/ Interface	:	HDMI & VGA / BNC
xvii.	I/O Ports	:	Minimum 02 USB 3.0 or latest Ports and interface for panic buttons
xviii.	Software Features	:	Software features shall be as per Clause no. 4.3 of the specification
xix.	Operating Temperature	:	As per EN 50155 category OT3
xx.	Humidity	:	95% RH, Non-condensing or as specified by the purchaser
xxi.	Regulatory Approvals/ Certifications	:	a) BIS / EN 50155/IEC 60571 for Rolling Stock application for Temperature, Humidity, Vibration, EMI & EMC. b) BIS (IS-13252 : Part 1 : 2010 or latest) for Equipment Safety.

SN	Parameter	:	Minimum Specification
			c) IEC 60068-2-10 or latest for Mould Growth Test of PCB. d) ONVIF Profile 'S' for the interface of network video product (ONVIF – Open Network Video Interface Forum). **Note:** For BIS/EN/IEC test certificate to be provided from internationally reputed and accredited test Labs/agencies or NABL/NABCB accredited Labs.

4.3 Video Management Software:

The Video Management Software shall be provided in Mobile-NVR and have following minimum features or otherwise as specified by the purchaser:

4.3.1 Live display of cameras on real-time basis.

4.3.2 Recording of Video in standard formats.

4.3.3 Playback of archived video.

4.3.4 Retrieval of archived video.

4.3.5 Configuration of system settings.

4.3.6 Configuration of Camera parameters.

4.3.7 The software shall support multiscreen display on monitors.

4.3.8 The Software shall support continuous recording, activity control recording, motion detection recording and Alarm and Trigger input recording etc.

4.3.9 In case Mobile NVR operation is interrupted, like power disconnection and once the Mobile NVR is restarted, the Mobile NVR shall automatically resume recording of cameras and microphones.

4.3.10 The VMS shall support network fault-tolerant recording such that if the network connection between Mobile NVR and Camera is unavailable, the Mobile NVR shall automatically recover when the connection is restored.

4.3.11 The VMS shall provide secured recording for evidence purposes with provision of watermarks, date & time, location, etc. and user authentication to protect data integrity.

4.3.12 It shall support recording search by camera, date and time, events etc. The VMS shall support export of video clips to USB drives in standard video formats like MP4 / AVI / MKV etc.

4.3.13 The system software shall maintain system log such as alarms, events and operator log etc.

4.3.14 It shall be possible for Mobile NVR to transfer and append the Video data to Server at Cloud/ Data Centre for the data if demanded.

4.3.15 The VMS shall support user management such as authentication of user login, configuration of users and user access rights.

4.3.16 It shall be possible to access Cameras through Mobile NVR for diagnostic and management purpose locally or from remote location.

4.3.17 It shall be possible for system to download or transfer event-based video footage during course of journey.

4.3.18 Camera Tampering or Camera Blinding analytics shall be provided for each Camera and shall have provision to store each such events for 30 days.

4.3.19 VMS shall have face image cropping feature for cameras installed at entry/exit doors. It shall identify the faces of person from the live feed and cropped image should meet the requirement of FRS (whenever FRS is applicable). VMS shall have provision to identify unique faces in a given duration of time; the time duration shall be configurable. This cropped face image with the metadata shall be stored in M-NVR and shall be downloaded for sending to Face matching Server.

4.3.20 The VMS shall be compliant to global standards ONVIF Profile 'S'. API/SDK is to be shared with the purchaser for integration purposes.

4.3.21 Security Verification Certification: The System Software shall have security features which can be deployed meeting all the parameters applicable to software for security, vulnerabilities, etc. with relevant and equivalent safeguards as per the latest OWASP Top 10 from STQC (Ministry of Electronics & Information Technology) only for testing and issuing the certificate / clearance.

4.4 Various Types of Cables:

4.4.1 STP CAT-6 or better Cable:

Fire Retardant STP (Shielded Twisted Pair) CAT-6 Cable or better shall be compliant with latest EIA/TIA-568-B.2-1 and IEC/EN 60332-1 standard or equivalent BIS for both.

4.4.2 Electrical Power Cable:

Electrical Cable used in the Rolling Stock for Video Surveillance System shall meet RDSO specification ELRS/SPEC/ELC/0019, Rev. 3 Feb. 2017(or latest Revision) and should be from approved vendor sources.

5.0 TEST REQUIREMENTS:

5.1 Unless otherwise specified all tests shall be carried out at ambient atmospheric conditions.

5.2 Inspection and testing shall be carried out to the effect that all requirements of this specification are complied with as per the latest Type Test Format (Doc. No. 0085) & Acceptance Test Format (Doc. No. 0086).

5.3 Routine Test /Factory Acceptance Test (FAT): Routine test /Factory Acceptance test (FAT) shall be conducted by Original Equipment manufacturer (OEM) on every items/equipment and the test results shall be submitted to the inspection authority before inspection (Type Test and Acceptance Test).

5.4 Regulatory Approvals/Certifications: All compliances to various standards as given in specifications shall be submitted with documentary proof to the inspection authority before inspection (Type Test and Acceptance Test).

5.5 TYPE TEST:

5.5.1 Cameras, Mobile NVR and VMS along with required accessories shall be considered as one system.

5.5.2 The following shall constitute the Type Tests which shall be carried out by the inspecting authority on randomly selected one system for the purpose of Type Test.

i) Visual inspection and Performance test (Clause no. 5.5.3)
ii) Endurance test (Clause no. 5.5.4)
iii) Environmental/Climatic Test & Ingress Protection (Clause no. 5.5.5)
iv) Verification of necessary Regulatory approvals/certifications (Clause no. 5.5.6)
v) Compliance of clause 3.13, 3.14, 3.15

5.5.3 **Visual Inspection and Performance Test:**

For Visual Inspection and Performance test, equipment/system shall be tested to ensure compliance of relevant specification. The compliances to Regulatory Approvals/ Certifications shall be submitted with documentary proof.

Each equipment of the system shall be visually inspected to ensure compliance with the requirement of relevant clauses no. 4.1 & 4.2 of the specification.

The visual inspection shall broadly include:

i) Constructional details
ii) Dimensional check

iii) General workmanship
iv) Configuration

Performance of each equipment/system shall be tested to ensure compliance with the requirement of relevant clauses no. 4.1 & 4.2 along with 4.3 of the specification.

5.5.4 **Endurance Test:**

Endurance test shall be conducted on one complete system for continuous operation which shall be 72 hrs. at ambient room temperature without giving any deterioration of equipment performance.

5.5.5 **Environmental/Climatic Test & Ingress Protection:**

Test certificates along with test reports shall be submitted for Temperature, Humidity, Vibration and EMI & EMC conducted on the equipment as per standards mentioned in clause nos. 4.1(xxiii)(a), 4.2(xxi)(a), Ingress Protection as per 4.1(xxi) of specification.

5.5.6 For Equipment Safety, ONVIF Profile 'S', and Vandal Proofing, test certificates along with test reports as per standards mentioned in the respective clauses of specification shall be submitted:

Description	Clause No.
Equipment Safety	4.1(xxiii)(b), 4.2(xxi)(b)
Mould Growth	4.1 (xxiii) (c), 4.2 (xxi) (c)
ONVIF-S	4.1(xxiii)(d), 4.2(xxi)(d), 4.3.20
Vandal Proof	4.1(xxii)

5.5.7 Any other tests shall be carried out as considered necessary by the inspecting authority.

5.6 ACCEPTANCE TEST:

5.6.1 The following shall constitute the Acceptance Tests which shall be carried out by the inspecting authority for the purpose of acceptance on randomly selected of items offered from the lot as per sampling plan (clause no. 5.6.2) offered for inspection by the supplier.
i) Visual inspection and Performance test (Clause no. 5.6.4)
ii) Endurance test (Clause no. 5.6.5)
iii) Compliance of clause 3.13, 3.14, 3.15

5.6.2 **Sampling Plan:** The Sampling Plan for Acceptance test shall be as under:

Quantity offered (Lot Size)			Sample size
2	to	8	2
9	to	15	3

Quantity offered (Lot Size)			Sample size
16	to	25	5
26	to	50	8
51	to	90	13
91	to	150	20
151	to	280	32
281	to	500	50
501	to	1200	80
1201	to	3200	125
3201	to	10000	200
10001	to	35000	315
35001	to	150000	500
150001	to	500000	800
500001	and over		1250

5.6.3 For various types of cables as per clause no. 4.4, Acceptance test shall be carried out on randomly selected 10% of items offered from the lot.

5.6.4 **Visual inspection and Performance test:**

For Visual Inspection and Performance test, equipment/system shall be tested to ensure compliance of relevant specification. The compliances to Regulatory Approvals/Certifications as applicable shall be submitted with documentary proof which is enumerated below:
i) EN 50155/IEC 60571 or equivalent BIS for Rolling Stock application
ii) BIS (IS-13252 : Part 1 : 2010 or latest) for Equipment Safety
iii) ONVIF Profile 'S'

Each equipment of the system shall be visually inspected to ensure compliance with the requirement of relevant clauses no. 4.1 & 4.2 of the specification.

The visual inspection shall broadly include:
i) Constructional details
ii) Dimensional check
iii) General workmanship
iv) Configuration

Performance of each equipment/system shall be tested to ensure compliance with the requirement of relevant clauses no. 4.1 & 4.2 along with 4.3 of the specification.

5.6.5 **Endurance test:**

Endurance test shall be conducted on randomly selected samples for continuous operation which shall be 48 hrs at ambient room temperature without giving any deterioration of equipment performance.

5.6.6 Any other tests shall be carried out as considered necessary by the inspecting authority.

5.7 **List of items on which Type Test and Acceptance Test is applicable:**

S.No.	Items	Clause No.
i.	Fixed Dome/Wedge Type IP Colour Camera	4.1
ii.	Mobile Network Video Recorder (Mobile NVR) with inbuilt Video Management Software	4.2 & 4.3
iii.	Microphone	A2.5

5.8 **List of items on which only Acceptance Test is applicable: NIL**

5.9 **Routine Test /Factory Acceptance Test (FAT):**

5.9.1 Routine test /Factory Acceptance test (FAT) shall be conducted by Original Equipment manufacturer (OEM) on every equipment and the test results shall be submitted to the inspection authority before inspection.

5.9.2 Firm shall submit the details such as make, model & version of every equipment including Software to inspection authority before inspection.

6.0 MARKING & PACKING:

6.1 The following information shall be clearly marked at a suitable place on each equipment:
i) Make and Model/Part No. of Equipment.
ii) Serial number of equipment with Manufacturing Month & Year.

6.2 The equipment and its sub-assemblies shall be packed in suitable packing so that it can withstand bumps and jerks encountered during transportation.

7.0 INFORMATION TO BE SUPPLIED BY THE PURCHASER:

The purchaser shall clearly indicate details/requirement of items which shall mainly consist of following items:

SN	Description	Clause No.	Quantity
i.	Fixed Dome/Wedge Type IP Colour Camera	4.1 & A2.15	As specified by the purchaser
ii.	Mobile NVR	4.2	As specified by the purchaser
iii.	VMS	4.3	As specified by the purchaser

SN	Description	Clause No.	Quantity
iv.	HHT/Tablet with min. 8TB external SSD	3.17	As specified by the purchaser
v.	Microphone	A2.5	As specified by the purchaser
vi.	STP CAT-6 Cable	4.4.1	As specified by the purchaser
vii.	Electrical Power Cable	4.4.2	As specified by the purchaser
viii.	Panic Button/Buttons	A1.3	As specified by the purchaser

Note: Detailed warranty clause as required shall be specified by the purchaser. Any maintenance requirement shall also be specified by the purchaser.

Annexure-1

ADDITIONAL REQUIREMENTS FOR TRAIN COACHES

Objective: To record all the activities in the doorway passage, coach compartment door area and vestibule portion (gangway area) for post event analysis.

A1.0 SYSTEM DESCRIPTION:

A1.1 Each Coach shall be installed with generally 04/06 nos. of Cameras. Camera to be installed on each entrance door side in such a way that one camera to cover the one entrance door and coach compartment door and other camera to cover the second entrance door and gangway (vestibule area).

Note: The above scheme is tentative and no. of cameras specific to coach variant is as per installation drawing mentioned in clause no. A1.4 given below.

A1.2 Each Coach shall be provided with a Mobile NVR along with inbuilt VMS.

A1.3 It is desirable to have minimum 02 nos. of Panic buttons in each coach. Location of panic buttons shall be as per the standard fixing protocol drawings mentioned in clause no. A1.4 below; However, no. of Panic Buttons and its suitable location shall be decided by the purchaser as per requirement.

A1.4 Standard fixing protocol for installation of CCTV system for various types of coaches is given below:

S.N.	Drawing No.	Type Variant	Type of Coach
1.	CG-18229	LHB AC	LWFAC, LWACCN / LWACCW, LWLRRM, LWSCZAC / LFCZAC / LWCBAC
2.	CG-18230	LHB NON AC	GS, LWSCN, LWSCZ, LDSLR
3.	CG-18231	ICF AC	WGFAC, WGACCW, WGACCN, WGSCZ
4.	CG-18232	ICF NON AC	SLRD, GS, SDC, WGSCN

Note: Latest drawings shall be obtained from concerned Directorate while implementation. The coaches which are not covered may be decided by the user with approval of the competent authority.

A1.9 The dimension of enclosure to house M-NVR, Power Supply Unit, etc. shall be within 400(L)x300(B)x200(H)mm approximately so as to house the equipment in such a way that maintenance can be done without any difficulty. The enclosure should be such that it is able to dissipate heat generated by equipment and should be aesthetic.

Note: The size defined indicative size; however as per the fixing requirement size may be defined by the user based on the available space.

Annexure-2

ADDITIONAL REQUIREMENTS FOR LOCOMOTIVES / SELF-PROPELLED VEHICLES

OBJECTIVE:

FOR POST EVENT ANALYSIS:

a) To provide data to investigators to understand the sequence of events leading to an incident and identify operational issues including Loco Pilot (LP) / Assistant Loco Pilot (ALP) performance.

b) To provide video recording of track and track side installations, i.e. LC gates, cabins, OHE masts, Signals, etc. in case of any event for post event analysis.

c) To record LP / ALP's voice for post event analysis and performance monitoring.

d) To provide video recording of OHE for post event analysis.

A2.0 SYSTEM DESCRIPTION:

A2.1 **For Electric Locomotives:**

Camera	**Nos.**
Cab view camera	01 in each Cab
Side view Camera	01 on the side of each Cab (LP Side)
Track view camera	01 on each end of Loco

Total per loco = 06 nos.

A2.2 **For Diesel Locomotives:**

With Dual Cab:

Camera	**Nos.**
Cab view camera	01 in each Cab
External view Camera	01 on each side of Cab 1 facing 90° to Track for side view
Track view camera	01 on each end of Loco

Total per loco = 06 nos.

With Single Cab Loco and Hood type ALCo Loco:

Camera	**Nos.**
Cab view camera	02 in Cab
External view Camera	01 on each side of Cab facing 90° to Track for side view
Track View camera	01 on each end of Loco

Total per loco = 06 nos.

A2.3 Standard fixing protocol for installation of equipment is given below:

S.N.	Drawing No.	Type Variant / Type of Loco
1.	SKEL - 5084 Alt. 3	Three-Phase Electric Loco
2.	SKEL - 5085 Alt. 3	Conventional Electric Loco
3.	SKDP - 4163, Alt. 1	WDP4, WDP4B, WDG4 & WDG6G Single Cab Locos
4.	SKDP - 4164, Alt. 1	WDP4D, WDG4D & WDG4G Dual Cab Locos
5.	SKDP - 4165, Alt. 1	Hood Type ALCO Locos

Note: Standard fixing protocol for installation of equipment shall be done as per latest drawings issued by concerned Directorate. The Locos/Self-Propelled Vehicles which are not covered may be decided by the user with approval of the competent authority.

A2.4 Separate flush type, screw mounted compact size microphone (02 nos., one each in front of LP/ALP) shall be used to record the voice conversation of crews in the cab & suitably mounted on driver desk for clear voice recording.

A2.5 The noise level inside the locomotives shall be studied to design the noise suppression facility accordingly. The audio recording shall be clear & audible and shall be verified in lab as well as in field before considering prototype clearance. The microphone shall have the following minimum specifications or otherwise as specified by the purchaser:

i.	Communication	TCP/IP
ii.	Signal to Noise Ratio	70 dB or higher
iii.	Sensitivity	Min. -40 dB
iv.	Noise Cancellation	Active Noise Cancellation. 20dB or better.
v.	Connector	M12
vi.	Type	Non-Protruding, Flush type with maximum dimension as 4”H x 4”W x 2”D

A2.6 The cameras, M-NVR including Microphones, etc. shall be tested as per clause no. 5.0 of this specification.

A2.7 Microphones & control equipment shall be suitable for operational temperature as per EN 50155 category OT3 and relative humidity up to 95% RH non-condensing.

A2.8 Acknowledgeable Audio-Visual alarm feature is required to indicate the failure of recording of any of the audio and video channel in each cab. The logging of data for failure of channel or any other abnormality in the system should be stored in the NVR.

A2.9 The system should facilitate for interfacing with Crash Hardened Memory (CHM) complying IEEE 1482.1 to store data simultaneously as future requirement and scalable feature. The preferred communication interface with CHM should be on Ethernet. The firm may submit the undertaking for supporting the interfacing with Crash Hardened Memory, if provided by Railways. The firm shall be bound to integrate the system with these requirements at later stage whenever asked. The CHM shall be provided by Railway or can be procured from the vendor.

A2.10 The Mobile NVR shall accommodate the minimum specified cameras (in cl. No. A2.1 & A2.2) and 02 nos. microphones, 01 no. RDAS and 01 no. CHM interface. The recorder shall be supplied in a compact enclosure. The size and orientation of NVR may be such that it suitably fit in rear wall of each Cab within available space is as under:

Length: 15.3 inch, Height: 21.0 inch, Depth: 3.0 inch

The enclosure of NVR may be maintained within above dimensions limit.

A2.11 The dimension of enclosure of outside cameras shall be kept minimum to avoid infringement to loco MMD.

A2.12 Location of HDMI port for display, all health display LED indication, USB port for data downloading and acknowledge switch should be at front portion of NVR for ease of access. Connectors should be on right side of NVR.

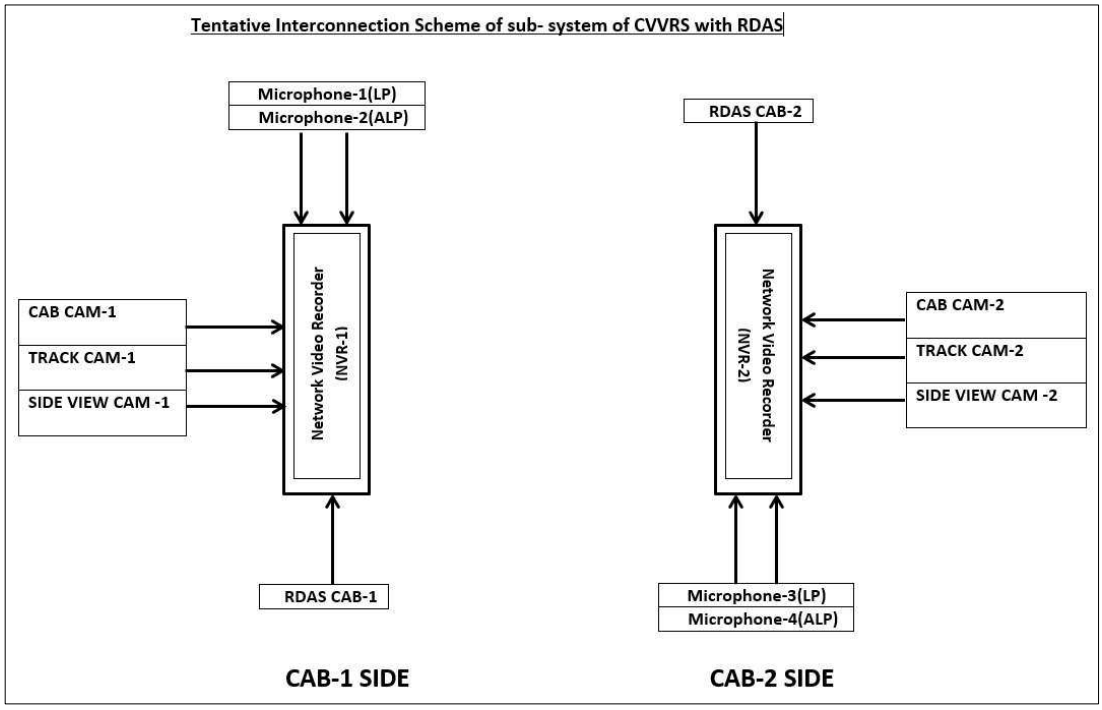
A2.13 Mounting arrangement shall be made to isolate vibration to avoid transmission of shock and vibration to the equipment to the extent possible. Camera shall be provided with suitable anti pilferage arrangement.

A2.14 Audio recording should be synchronized with respective camera. All inside and outside cameras including microphones of both the cabs of the locomotive shall remain 'ON'.

A2.15 At present, camera parameters for outdoor camera shall be same as given in clause no. 4.1; However, based on the availability of STQC approved cameras, following enhanced parameters shall be considered for outdoor cameras or as specified by the purchaser.

Resolution	4 MP (Fixed lens).
Lens	Focal length-3.6mm or better (Fixed lens) except Panto-view camera.
Frames per second	45 FPS or more.
Image Stabilization	Feature should be available.

A2.16 Tentative Interconnection Scheme of sub-system with RDAS:



A2.17 Functional Requirements for Railway Driver Assistance System (RDAS) are included in the specification as Annexure-3 for conducting separate trials.

Annexure-3

FUNCTIONAL REQUIREMENTS FOR RAILWAY DRIVER ASSISTANCE SYSTEM (RDAS)

A3.1 Introduction

Alertness of the Loco Pilots is one of the important considerations for safe running of trains. Drowsiness/ lack of alertness threatens the rail safety and may cause severe loss of Railway property as well as human lives. Drowsiness generally implies feeling lethargic, lack of concentration and tired eyes of the loco pilots while driving the locomotives/trains. To monitor the loco pilots for improving his alertness, RDAS will be able to detect the drowsiness/lack of alertness nature of the loco pilot and alert him immediately. RDAS will capture images as a video stream through a camera, detect the face and localizes the eyes and other face parameters. All the face parameters & responses of loco pilot are then analyzed for detection of drowsiness/lack of alertness. Based on the result, the loco pilot will be alerted through an alarm system.

A3.2 Objective & Scope

A3.2.1 This document lists the functional requirements of 'Railway Driver Assistance System (RDAS)' for use on Electric & Diesel locomotives and any self-propelled vehicle treated as a train of Indian Railways. This document has been prepared with an objective to stipulate the requirements for RDAS, which shall assess the Loco Pilot's alertness and shall warn the Loco Pilot accordingly.

A3.2.2 The specification covers basic features of equipment. It is the responsibility of the manufacturer/supplier to develop circuit/detailed design to meet the requirements of this specification.

A3.3 Tests, Verification & Validation

To be governed as per clause no. 5.0 of this specification & verification of General and Functional requirements under Clause A3.5 of this document.

Manufacturers shall carry out validation testing to ensure that RDAS is able to monitor driver drowsiness/alertness in a manner which is accurate, robust and scientifically valid. Validation testing shall be taken using human participants.

A3.4 General Requirements

i. RDAS shall be a standalone system which will be a combination of an Analytics Unit (consisting of an AI processing unit, data storage memory, interfacing ports for connecting with Network Video Recorder, speaker to generate voice command in case of any abnormal condition detected by

RDAS, Visual indication for any abnormal condition detected by RDAS) and Camera(s) (inbuilt / external).

ii. The power supply available for RDAS to be governed as per Clause 3.16 of this specification. Power supply for RDAS is to be drawn from loco battery circuit after cab activation/BL switch in order to enable RDAS functionalities in active cab only.

iii. The RDAS shall be designed to avoid or minimize the system error rate under actual driving conditions.

iv. Required cables of sufficient length and conduit pipe for installation & commissioning of RDAS in locomotive shall be in the scope of supplier.

v. 72V/110V DC MCB of suitable current rating to be supplied along with RDAS.

vi. Application software for data downloading from RDAS shall be provided.

vii. RDAS must have at least two programmable relay outputs to enable its interfacing with other devices of the locomotive. Additionally, the firm responsible for the RDAS must make the necessary software or hardware modifications to fulfill this requirement.

viii. RDAS shall be suitable for operational temperature as per EN 50155 category OT3 and relative humidity up to 95% RH non-condensing.

A3.5 Functional Requirements

i. RDAS is to be installed on the driving desk and vision envelope must cover LP facial expression in sitting as well as standing condition. The RDAS should be compact & should not create any obstruction to loco pilot in his normal working.

ii. Industrial grade Vibration and Shock Proof Solid State Drive (SSD) shall be used for data storage and should not be removable from RDAS.

iii. The RDAS shall have an Ethernet port for interfacing with existing M-NVR and USB port (latest) for data downloading/service & maintenance

iv. Minimum two modes of warnings (Visual and acoustic) shall be provided.

v. The visual warning shall be located so as to be readily visible and recognizable in daylight and at night-time by the driver and distinguishable from other alerts. The visual warning shall be a steady or flashing indication (e.g. tell-tale, pop-up message, etc.).

vi. The acoustic warning shall be easily recognized by the driver. The voice / audio alert shall persist until the driver acknowledges it.

vii. A constant visual signal (e.g. tell-tale, pop-up message, etc.) shall be provided to check the health of RDAS and detect any failure in the RDAS itself which may result in the RDAS to stop functioning.

viii. There shall not be an appreciable time interval between each RDAS self-check, and subsequently there shall not be a delay in displaying the failure warning signal.

ix. The RDAS shall record the alert with background recording of LP before & after of 30 sec. duration (configurable) for at least 30 days on FIFO basis.

x. The RDAS should be able to function satisfactorily with all face types and with & without glasses.

xi. The RDAS shall operate effectively during the day and night under cab light condition.

xii. The RDAS shall detect atleast following in running condition of locomotives:

a. Eye drowsiness detection

b. Yawning detection

c. Distracted detection

d. Phone call detection

e. Smoking detection

f. No driver detection

g. Head phone detection to the extent possible

h. Camera covered

xiii. Audio & Visual warning used by the RDAS to alert the driver shall be presented immediately without delay after detection of the condition and may cascade and intensify until same is acknowledged by the driver.

xiv. All types of warning signals proposed to be provided in the RDAS to alert the Loco Pilot should be submitted during design approval stage. All voice alerts shall be in English & Hindi language.

xv. The RDAS shall work up to a distance of 1.5m & shall detect all the conditions mentioned above.

xvi. The recognition rate up to a distance of 1.5m shall be achieved as follows:

a. Minimum acceptance criteria for POC: 80% (Day time) and 70% (Night time) for individual type of detection.

b. Minimum acceptance criteria for Final Commissioning: 90% (Day time) and 80% (Night time) for individual type of detection.

Note: Time to time, the efforts shall be made in achieving the recognition rate upto 100% in day & night time.

xvii. The sound of alarm & voice messages should be clear & audible when locomotive is in working condition.

xviii. It shall not be possible for the driver to manually deactivate the RDAS.

Annexure-4

ADDITIONAL REQUIREMENTS FOR TRAIN SETS / EMU / DEMU / MEMU / KOLKATA METRO

Objective: a) Covering the above requirements mentioned for coaches and locomotives in Annexure – 1 & 2.
b) Monitor audio / video alerts in case of emergencies from coach (through ETBU).
c) To assist driver & guard to monitor the platform view near doors outside the coaches. (External train view)

A4.1 SYSTEM DESCRIPTION:

A4.1.1 a) No. of Cameras in Three Phase propulsion (driving cab) based EMU / DEMU / MEMU is as given below:

Camera	**Nos per cab**
Cab view camera	01 in each Cab
External view Camera	02 on the side of each Cab
Track View camera	01 no. on each Cab
Panto view camera*	01 no.
*Only for those type of coaches which have pantograph.	

b) No. of Cameras in Three Phase propulsion (Driving cab) based Train set / Kolkata Metro is as given below:

Camera	**Nos per cab**
Cab view camera	02 in each Cab
External view Camera	02 on the side of each Cab
Track View camera	01 no. on each Cab
Panto view camera*	01 no.
*Only for those type of coaches which have pantograph.	

CCTV Cameras and microphone in both the cabs will follow the same pattern / functionalities as for Electric Locomotives as mentioned in Annexure-2

A4.1.2 CCTV Cameras in all the coaches will follow the same pattern/functionalities as given for coaches in Annexure-1 with following details:

No. of Cameras in Three Phase propulsion-based Coaches of EMU/ MEMU/ Train set/ Kolkata Metro:

Camera	Nos per coach
Camera inside the coach	As per revised layouts attached of respective Rolling Stock
External view Camera	02 on the side of each NDTC or NDMC or DMC (used in the middle of rake) type coaches only
Panto view camera	01 no. for each non driving coach having a pantograph

a. Each NDTC or NDMC coaches should have rear/external view camera (2 numbers) one on each side with same objective as the external view camera as used in the driving cabs.

b. Each non-driving coach having a pantograph should have a Panto view camera (1 number) with same objective as the Panto camera as used in the driving cabs.

c. Standard fixing protocol for installation of CCTV system is given below:

S.N.	Drawing No.	Type Variant / Type of Coach
1.	ICF/SK3-9-0-248 (Sheet 1 & 2) (Alt-g or latest)	MEMU, DEMU, EMU and MRVC Coaches
2.	ICF/SK3-9-0-171 (Alt-d or latest)	3-Phase Air-conditioned AC/EMU Coaches
3.	ICF/SK3-7-6-094 (Alt-a or latest)	Kolkata Metro Coaches
4.	ICF/SK3-7-6-102 (Alt-Nil or latest)	Train Set Coaches

Note: Standard fixing protocol for installation of VSS equipment shall be done as per latest drawings issued by concerned Directorate. The EMU / MEMU / Train set/ Kolkata Metro which are not covered may be decided by the user with approval of the competent authority.

A4.1.3 For each driving coach, the system of Video Surveillance System should be separate for recording Cab cameras as mentioned in A4.1.1 (a) & (b) above and Coach Cameras as mentioned in A4.1.2 above (i.e. separate NVR and its storage).

A4.2 For new Rolling Stock to be manufactured (EMU / MEMU / Train set/ Kolkata Metro):

Additional interconnectivity requirements and functions given below will be integrated by the System/Propulsion supplier. The CCTV system supplier should give Interface Capability for these below mentioned functions:

A4.2.1 The CCTV shall be connected train-wide on a comfort / separate network with necessary interface with Train Control Management System.

A4.2.2 Mobile NVR along with VMS shall be provided at suitable location based on the number of Cameras that NVR can handle and store its video. The number of channels in NVRs will be as per the requirement after considering networking using switches for the required number of the Cameras in coaches or basic unit. The same shall be evaluated during design stage of video surveillance system.

A4.2.3 In reference to Para 4.2(viii) of this spec, the storage memory of NVR (SSD) can be shared among coaches. However, the aggregate of all the storage should be such that, in a train, for coaches having more than 8 cameras, it should be minimum 8 TB storage per coach and for coaches having 8 or less than 8 cameras, it should be minimum 4 TB storage per coach.

A4.2.4 An integrated screen shall be provided for the passenger Car surveillance system in each Driving Cab. It shall be so placed in the cab that normally it does not cause distraction to the Train operator but it shall be easily viewable by the Train Driver / Guard, when needed.

A4.2.5 Under normal operation, the views gathered from each of the camera located in the Train shall be sequentially played in the monitor screens of both the cabs. Adequate controls shall be provided for necessary surveillance requirements and priorities.

A4.2.6 The system shall have self-diagnostics and communicate the same suitably to train operator / maintainer. The health of the complete CCTV surveillance system shall be displayed in CCTV display in both driver cabs.

A4.2.7 The architecture of the CCTV system shall have NVR with high-speed downloading port, at basic unit level. The visual images of surveillance cameras of all coaches shall be downloadable from centralized location.

A4.2.8 If any Passenger Alarm System & ETBU (Emergency Talk Back Unit) is operated in any of the coach in case of emergency, immediately nearby two camera views are override on priority on CCTV display unit. These ETBU nearby camera views are displayed immediately after initiate the call from passenger. If driver / guard reject the call, display will go back to the previous screen. If driver / guard accept the call, ETBU nearby camera views are continuously displayed till the ETBU call ends by driver / guard.

A4.2.9 The two cameras per basic unit shall be placed on outer sides of each Basic Unit as a minimum for gathering rear view of the platform. Mounting of camera shall be unobtrusive, flushed with, or recessed into the interior panel. Selection of type shall be finalized during design and shall ensure clear view of passengers on platform to Train Driver/Guard before start at each station till Train leaves the platform completely. The system shall automatically switch to rear view when the Train stops and will go back to default mode

after the Train leaves the platform. The camera shall be suitably selected in respect of resolution, clarity of images, illumination conditions for on-train applications and shall be of proven design for high-speed trains.

A4.2.10 The audio & video recording of driver Cab Cameras and microphone shall be integrated with Train-wide network for storing the same for required duration (as mentioned in the respective propulsion system specification) in the memory of Event recorder (Crash Protected Memory).

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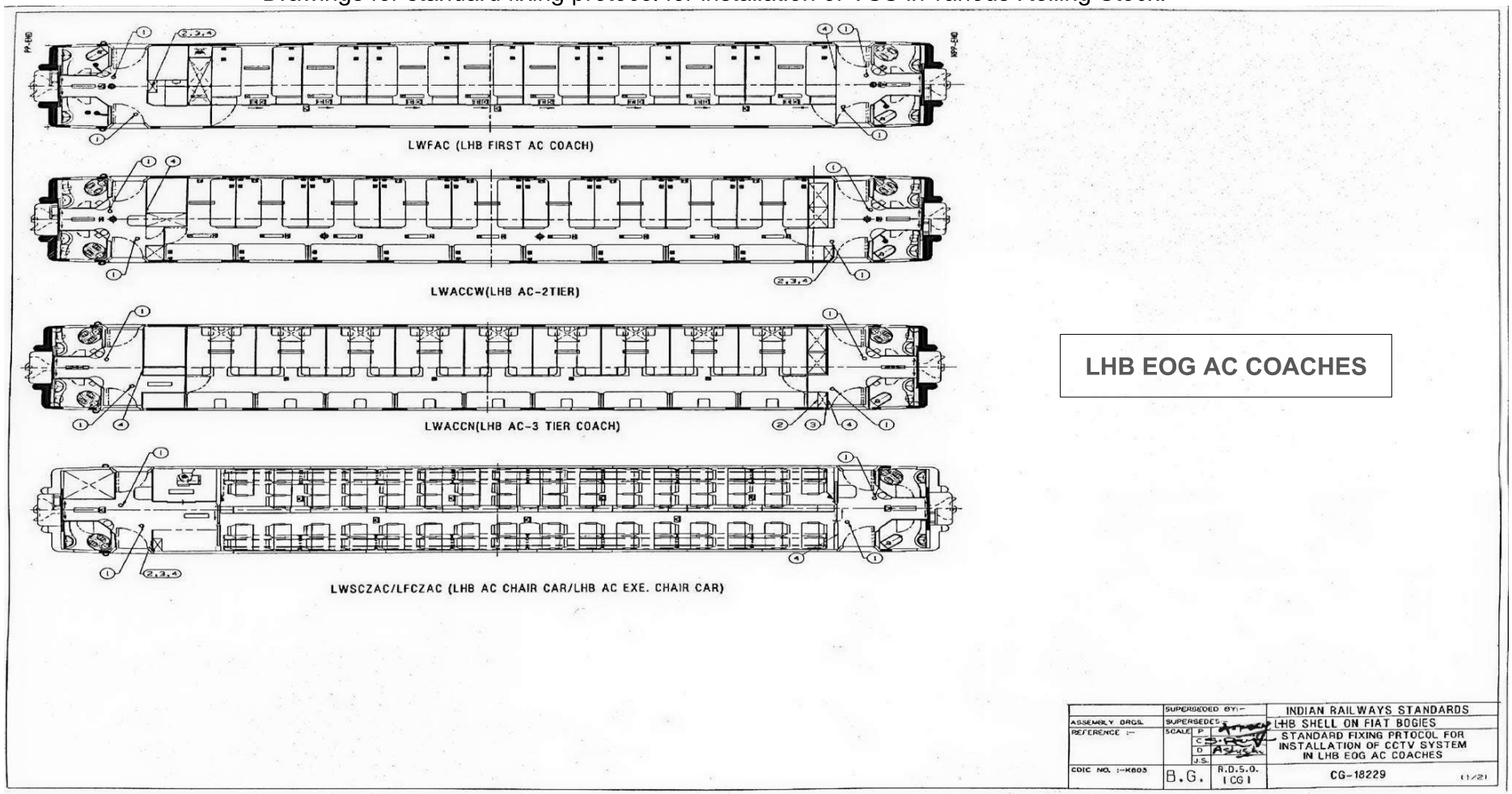
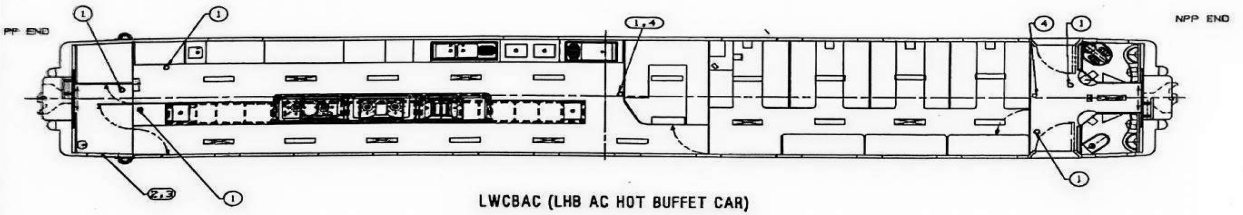
Annexure-5

Drawings for standard fixing protocol for installation of VSS in various Rolling Stock:

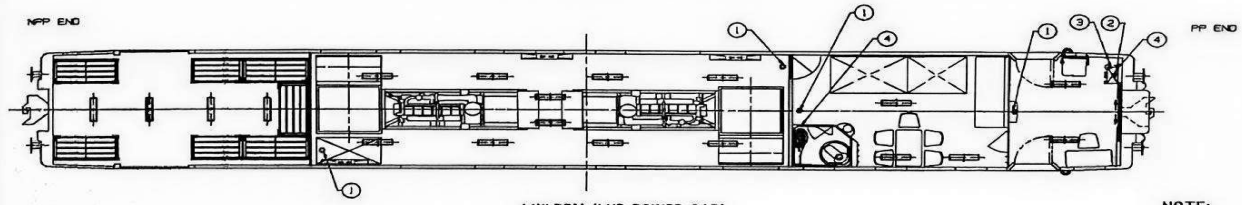


3915971/2025/O/o ED/Tele-I/RDSO

ISO 9001-2015	RDSO/SPN/TC/106/2025	Version 3.1	Effective from 04.06.2025
Document Title: Specification for the item: IP Based Video Surveillance System for Rolling Stock of Indian Railways			



LWCBAC (LHB AC HOT BUFFET CAR)



LWLRRM (LHB POWER CAR)

LHB EOG AC COACHES

NOTE:

1. THIS DRAWING IS APPLICABLE FOR LHB EOG AC COACHES SUCH AS LWFAC, COMPOSITE COACH (FAC+AC-2T)LWFCACCW, LWACCW,LWACCN,LWLRRM,LWSCZAC AND LWFCZAC, LWCBAC.
2. ITEM-1 CCTV CAMERA TO BE INSTALLED ON EACH SIDE IN A WAY THAT ONE CAMERA TO COVER THE ONE DOOR & GANGWAY (VESTIBULE) AREA & OTHER CAMERA TO COVER SECOND DOOR & COMPARMENT DOOR
3. ITEM-2 MNVR/VIDEO RECORDING UNIT WITH POWER SUPPLY UNIT SHALL BE MOUNTED IN A SEPERATE CUBICLE BOX BELOW CEILING LEVEL AT LOCATION AS MENTIONED IN VIEW. LOCATION OF BOX IS TENTATIVE AND SIZE OF THE BOX SHOULD BE KEPT AS MINIMUM FROM AESTHETIC POINT OF VIEW AND ALSO TO AVOID INFRINGEMENT IN DOORWAYS.
4. ~~ITEM-3 ANTENNA SHALL BE FIXED IN SUCH A WAY THAT IT CAN BE VISIBLE FROM DOORWAY WINDOW AT SUITABLE LOCATION AS MENTIONED IN VIEW.~~
5. ITEM-4 PANIC BUTTON SHALL BE LOCATED IN SUCH A WAY THAT IT IS VISIBLE FROM CCTV CAMERA AS MENTIONED IN VIEW AT THE HEIGHT OF 1600MM FROM FLOOR LEVEL.
6. IN LHB EOG AC COMPOSITE COACH (FAC+AC-2T), FOR LOCATION & FIXING OF ITEM-2,3&4, LOCATION AS MARKED IN LWFAC COACH, SHALL BE FOLLOWED. FOR ITEM-1, LOCATION MARKED IN LWFAC AND LWACCW COACH SHALL BE FOLLOWED IN RESPECTIVE PASSENGER AREA.
7. IN LHB EOG AC EXECUTIVE CHAIR CAR, FOR LOCATION & FIXING OF ITEM-1,2&3,LOCATION AS MARKED IN LWSCZAC COACH, SHALL BE FOLLOWED.
8. GUIDELINES FOR ELECTRICAL SUPPLY, SAFETY AND SUPPLIER'S SCOPE OF WORK TO BE FOLLOWED AS PER ATTACHED ANNEXURE-A.
9. * NUMBER OF CCTV CAMERA IN PANTRY CAR IS 8.

ITEM	DESCRIPTION & DIMENSIONS	NO. REQ.	REF. DRG	MFG. OF SHE CO	MATL. & SPEC	REMARKS
4	PANIC BUTTON	2	-	-	-	-
3	ANTENNA	1	-	-	-	-
2	MNVR/VIDEO RECORDING UNIT WITH POWER SUPPLY UNIT	1	-	-	-	-
1	CCTV CAMERA	4*	-	-	-	-

ALT.	ITEM	AUTHY.	DESCRIPTION	CKD.	DATE
5	-	25/05/25	1. LOCATION & QTY OF ITEM NO. 1 CHANGED 2. MOUNT NO. 2,4 & MODIFIED AND POINT NO. 2 DELETED	-	05/25
4	-	25/01/25	1. LOCATION OF ITEM NO. 2&3 UPDATED. 2. NOTE 8 TO 14 DELETED AND NEW NOTE NO.8 ADDED	-	01/25
3	-	25/01/24	DRAWING UPDATED	-	12/23
2	-	25/07/23	DRAWING UPDATED	-	12/23
1	-	25/03/23	1. NOTE NO. 10,11,12 ADDED AND NOTE NO. 3, 5,6,8 MODIFIED. 2. QUANTITY OF ITEM NO.4 MODIFIED TO 5 NO. ACCORDINGLY DRAWING UPDATED.	-	11/22

ASSEMBLY DRGS.
REFERENCE :-
CDIC NO. :-K803

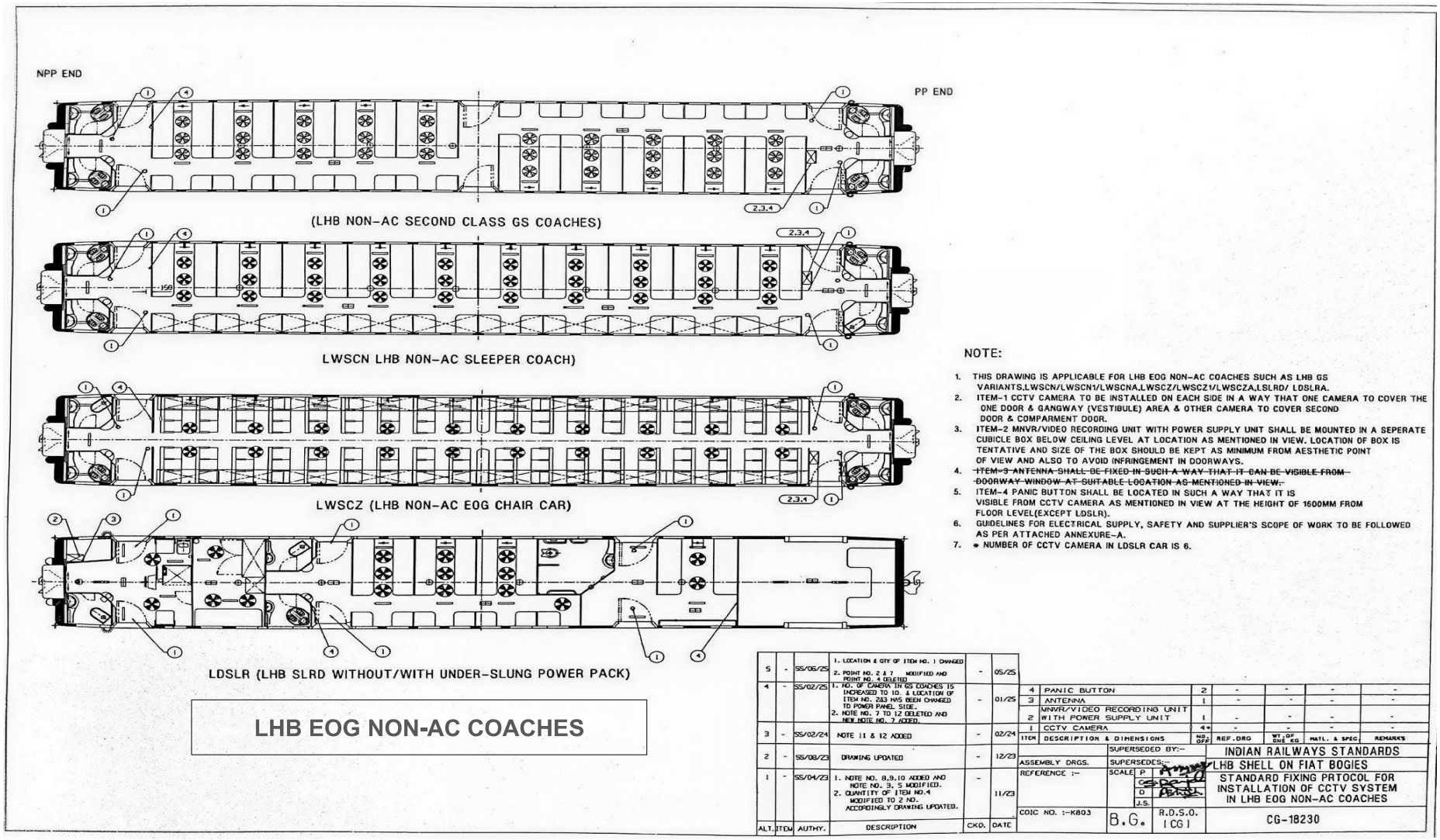
SUPERSEDED BY:-
SUPERSEDES:-
SCALE P C D J.S.

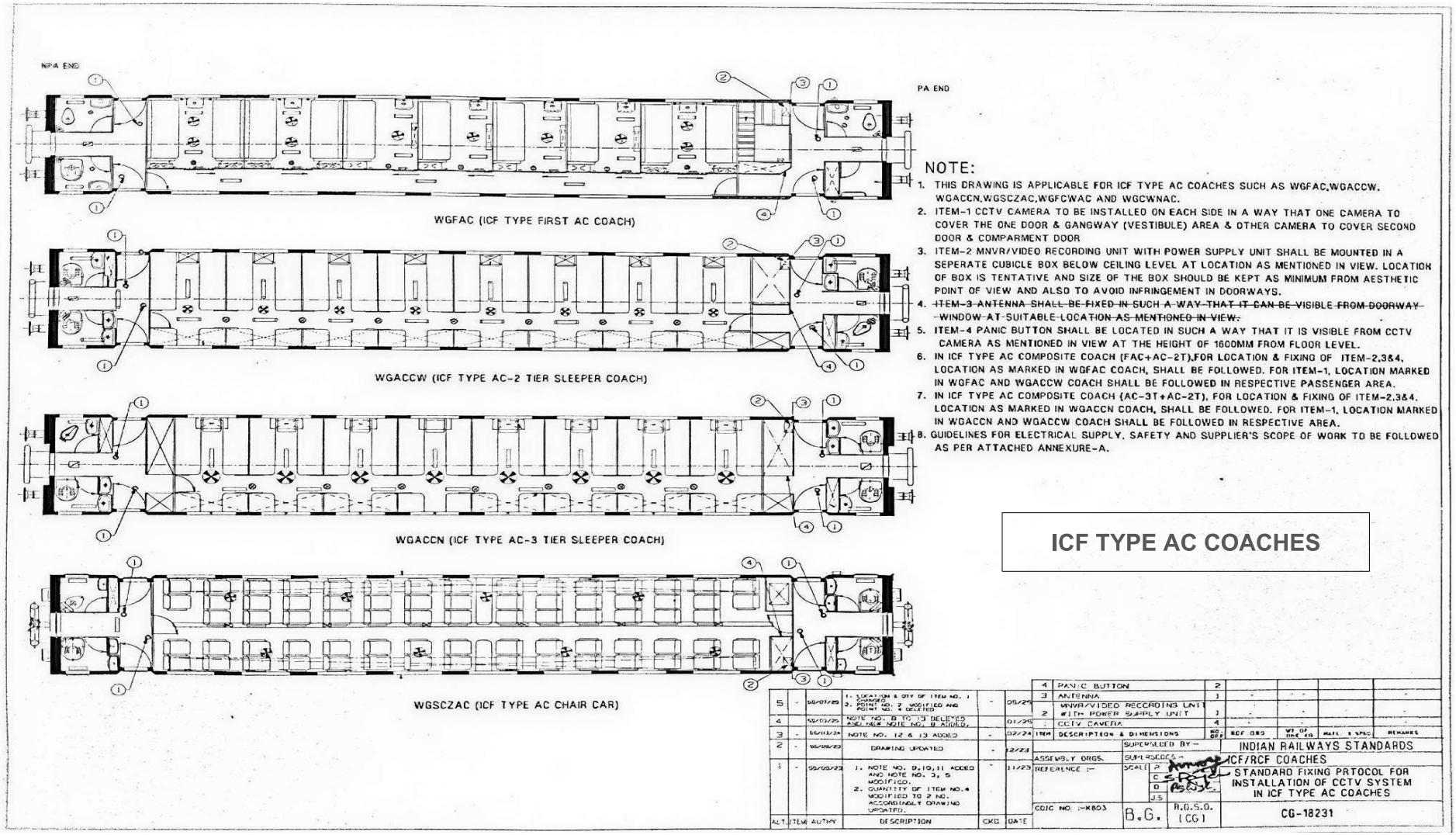
B.G.

R.D.S.O. [CG]

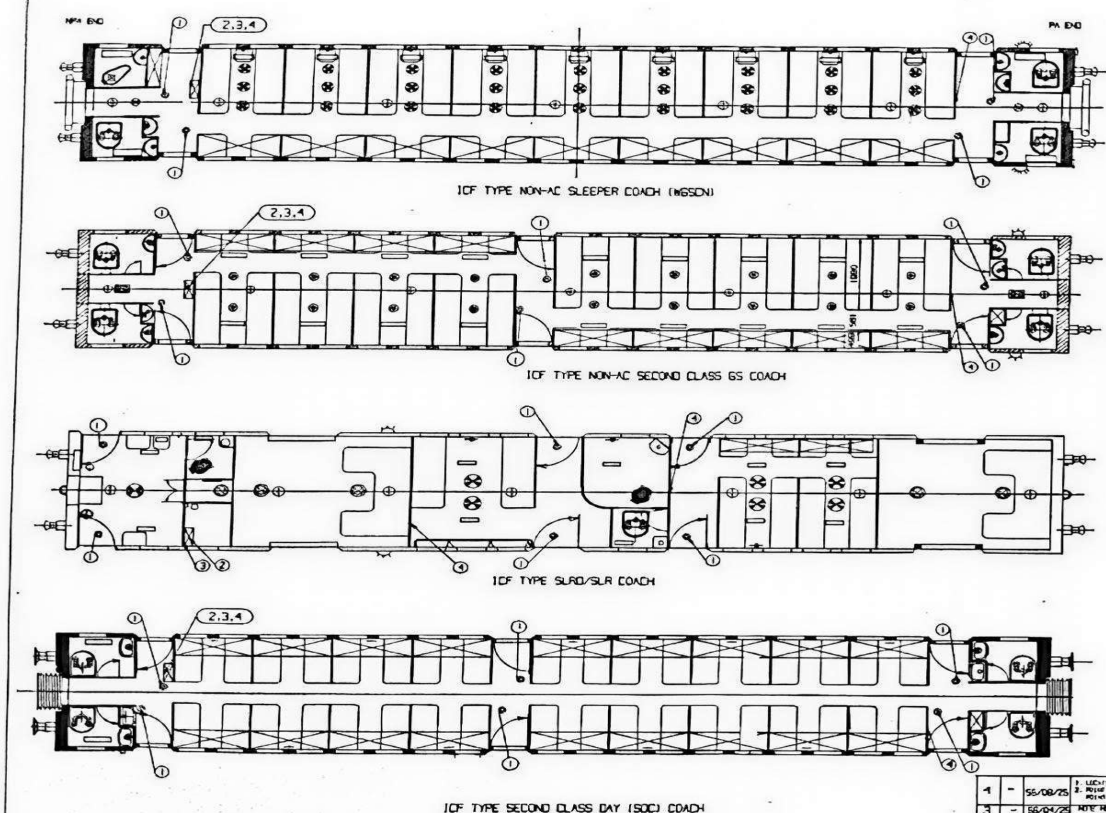
INDIAN RAILWAYS STANDARDS
LHB SHELL ON FIAT BOGIES
STANDARD FIXING PRTOCOL FOR INSTALLATION OF CCTV SYSTEM IN LHB EOG AC COACHES

CG-18229 (2/2)


NPP END
PP END
(LHB NON-AC SECOND CLASS GS COACHES)
LWSCN LHB NON-AC SLEEPER COACH)
LWSCZ (LHB NON-AC EOG CHAIR CAR)
LDSLR (LHB SLRD WITHOUT/WITH UNDER-SLUNG POWER PACK)
LHB EOG NON-AC COACHES
NOTE:
1. THIS DRAWING IS APPLICABLE FOR LHB EOG NON-AC COACHES SUCH AS LHB GS VARIANTS,LWSCN/LWSCN1/LWSCNA,LWSCZ/LWSCZ1/LWSCZA,LSLRD/ LDSLRA.
2. ITEM-1 CCTV CAMERA TO BE INSTALLED ON EACH SIDE IN A WAY THAT ONE CAMERA TO COVER THE ONE DOOR & GANGWAY (VESTIBULE) AREA & OTHER CAMERA TO COVER SECOND DOOR & COMPARMENT DOOR.
3. ITEM-2 MNVR/VIDEO RECORDING UNIT WITH POWER SUPPLY UNIT SHALL BE MOUNTED IN A SEPERATE CUBICLE BOX BELOW CEILING LEVEL AT LOCATION AS MENTIONED IN VIEW. LOCATION OF BOX IS TENTATIVE AND SIZE OF THE BOX SHOULD BE KEPT AS MINIMUM FROM AESTHETIC POINT OF VIEW AND ALSO TO AVOID INFRINGEMENT IN DOORWAYS.
4. ~~ITEM-3 ANTENNA SHALL BE FIXED IN SUCH A WAY THAT IT CAN BE VISIBLE FROM DOORWAY WINDOW AT SUITABLE LOCATION AS MENTIONED IN VIEW.~~
5. ITEM-4 PANIC BUTTON SHALL BE LOCATED IN SUCH A WAY THAT IT IS VISIBLE FROM CCTV CAMERA AS MENTIONED IN VIEW AT THE HEIGHT OF 1600MM FROM FLOOR LEVEL(EXCEPT LDSLR).
6. GUIDELINES FOR ELECTRICAL SUPPLY, SAFETY AND SUPPLIER'S SCOPE OF WORK TO BE FOLLOWED AS PER ATTACHED ANNEXURE-A.
7. * NUMBER OF CCTV CAMERA IN LDSLR CAR IS 6.
5 - SS/06/25 1. LOCATION & QTY OF ITEM NO. 1 CHANGED 2. POINT NO. 2 & 7 MODIFIED AND POINT NO. 4 DELETED - 05/25
4 - SS/02/25 1. NO. OF CAMERA IN GS COACHES IS INCREASED TO 10. & LOCATION OF ITEM NO. 2&3 HAS BEEN CHANGED TO POWER PANEL SIDE. 2. NOTE NO. 7 TO 12 DELETED AND NEW NOTE NO. 7 ADDED. - 01/25
3 - SS/02/24 NOTE 11 & 12 ADDED - 02/24
2 - SS/08/23 DRAWING UPDATED - 12/23
1 - SS/04/23 1. NOTE NO. 8,9,10 ADDED AND NOTE NO. 3, 5 MODIFIED. 2. QUANTITY OF ITEM NO.4 MODIFIED TO 2 NO. ACCORDINGLY DRAWING UPDATED. - 11/23
ALT. ITEM AUTHY. DESCRIPTION CKD. DATE
4 PANIC BUTTON 2
3 ANTENNA 1
2 MNVR/VIDEO RECORDING UNIT WITH POWER SUPPLY UNIT 1
1 CCTV CAMERA 4*
ITEM DESCRIPTION & DIMENSIONS NO OFF REF.DRG WT. OF ONE EQ MATL. & SPEC REMARKS
SUPERSEDED BY:-
ASSEMBLY DRGS. SUPERSEDES:-
REFERENCE :-
COIC NO. :-K803
SCALE P O J.S.
B.G.
R.D.S.O. ICGI
INDIAN RAILWAYS STANDARDS
LHB SHELL ON FIAT BOGIES
STANDARD FIXING PRTOCOL FOR INSTALLATION OF CCTV SYSTEM IN LHB EOG NON-AC COACHES
CG-18230


NPA END
PA END
WGFAC (ICF TYPE FIRST AC COACH)
WGACCW (ICF TYPE AC-2 TIER SLEEPER COACH)
WGACCN (ICF TYPE AC-3 TIER SLEEPER COACH)
WGSCZAC (ICF TYPE AC CHAIR CAR)
NOTE:
1. THIS DRAWING IS APPLICABLE FOR ICF TYPE AC COACHES SUCH AS WGFAC,WGACCW, WGACCN,WGSCZAC,WGFCWAC AND WGCWNAC.
2. ITEM-1 CCTV CAMERA TO BE INSTALLED ON EACH SIDE IN A WAY THAT ONE CAMERA TO COVER THE ONE DOOR & GANGWAY (VESTIBULE) AREA & OTHER CAMERA TO COVER SECOND DOOR & COMPARMENT DOOR
3. ITEM-2 MNVR/VIDEO RECORDING UNIT WITH POWER SUPPLY UNIT SHALL BE MOUNTED IN A SEPERATE CUBICLE BOX BELOW CEILING LEVEL AT LOCATION AS MENTIONED IN VIEW. LOCATION OF BOX IS TENTATIVE AND SIZE OF THE BOX SHOULD BE KEPT AS MINIMUM FROM AESTHETIC POINT OF VIEW AND ALSO TO AVOID INFRINGEMENT IN DOORWAYS.
4. ITEM-3 ANTENNA SHALL BE FIXED IN SUCH A WAY THAT IT CAN BE VISIBLE FROM DOORWAY WINDOW AT SUITABLE LOCATION AS MENTIONED IN VIEW.
5. ITEM-4 PANIC BUTTON SHALL BE LOCATED IN SUCH A WAY THAT IT IS VISIBLE FROM CCTV CAMERA AS MENTIONED IN VIEW AT THE HEIGHT OF 1600MM FROM FLOOR LEVEL.
6. IN ICF TYPE AC COMPOSITE COACH (FAC+AC-2T),FOR LOCATION & FIXING OF ITEM-2,3&4, LOCATION AS MARKED IN WGFAC COACH, SHALL BE FOLLOWED. FOR ITEM-1, LOCATION MARKED IN WGFAC AND WGACCW COACH SHALL BE FOLLOWED IN RESPECTIVE PASSENGER AREA.
7. IN ICF TYPE AC COMPOSITE COACH (AC-3T+AC-2T), FOR LOCATION & FIXING OF ITEM-2,3&4, LOCATION AS MARKED IN WGACCN COACH, SHALL BE FOLLOWED. FOR ITEM-1, LOCATION MARKED IN WGACCN AND WGACCW COACH SHALL BE FOLLOWED IN RESPECTIVE AREA.
8. GUIDELINES FOR ELECTRICAL SUPPLY, SAFETY AND SUPPLIER'S SCOPE OF WORK TO BE FOLLOWED AS PER ATTACHED ANNEXURE-A.
ICF TYPE AC COACHES
4 PANIC BUTTON 2
3 ANTENNA 1
2 MNVR/VIDEO RECORDING UNIT WITH POWER SUPPLY UNIT 1
1 CCTV CAMERA 4
DESCRIPTION & DIMENSIONS
INDIAN RAILWAYS STANDARDS
ICF/RCF COACHES
STANDARD FIXING PRTOCOL FOR INSTALLATION OF CCTV SYSTEM IN ICF TYPE AC COACHES
CG-18231

ISO 9001-2015	RDSO/SPN/TC/106/2025	Version 3.1	Effective from 04.06.2025
Document Title: Specification for the item: IP Based Video Surveillance System for Rolling Stock of Indian Railways			



NOTE:
1. THIS DRAWING IS APPLICABLE FOR ICF TYPE NON-AC COACHES SUCH AS WGSCN,GS, SLR/SLRD AND SECOND CLASS DAY COACH (SDC).
2. ITEM-1 CCTV CAMERA TO BE INSTALLED ON EACH SIDE IN A WAY THAT ONE CAMERA TO COVER THE ONE DOOR & GANGWAY (VESTIBULE) AREA & OTHER CAMERA TO COVER SECOND DOOR & COMPARMENT DOOR
3. ITEM-2 MNVR/VIDEO RECORDING UNIT WITH POWER SUPPLY UNIT SHALL BE MOUNTED IN A SEPERATE CUBICLE BOX BELOW CEILING LEVEL AT LOCATION AS MENTIONED IN VIEW. LOCATION OF BOX IS TENTATIVE AND SIZE OF THE BOX SHOULD BE KEPT AS MINIMUM FROM AESTHETIC POINT OF VIEW AND ALSO TO AVOID INFRINGEMENT IN DOORWAYS.
4. ~~ITEM-3 ANTENNA SHALL BE FIXED IN SUCH A WAY THAT IT CAN BE VISIBLE FROM DOORWAY WINDOW AT SUITABLE LOCATION AS MENTIONED IN VIEW.~~
5. ITEM-4 PANIC BUTTON SHALL BE LOCATED IN SUCH A WAY THAT IT IS VISIBLE FROM CCTV CAMERA AS MENTIONED IN VIEW AT THE HEIGHT OF 1600MM FROM FLOOR LEVEL.
6. ~~NUMBER OF CCTV CAMERA & PANIC BUTTON FOR SLRD COACH ARE 5 & 2 RESPECTIVELY.~~
7. GUIDELINES FOR ELECTRICAL SUPPLY, SAFETY AND SUPPLIER'S SCOPE OF WORK TO BE FOLLOWED AS PER ATTACHED ANNEXURE-A.
8. * NUMBER OF CCTV CAMERA IN WGSCN IS 4.

ICF TYPE NON-AC COACHES

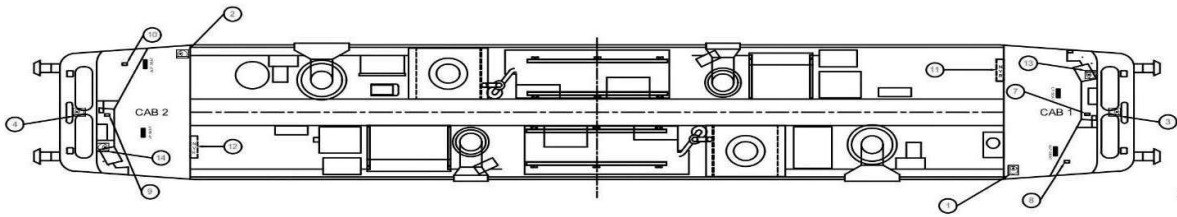
ITEM	DESCRIPTION & DIMENSIONS	NO OFF	REF. DRG	WT OF ONE KG	MATL. & SPEC	REMARKS
4	PANIC BUTTON	2				
3	ANTENNA	1	-	-		
2	MNVR/VIDEO RECORDING UNIT WITH POWER SUPPLY UNIT	1	-	-		
1	CCTV CAMERA	6*	-	-		

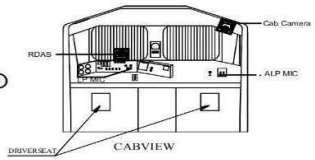
4	-	56/08/25	1. LOCATION & QTY OF ITEM NO. 1 CHANGED 2. POINT NO. 2 MODIFIED AND POINT NO. 4 & 6 DELETED, POINT 8 ADDED	-	08/25
3	-	56/04/25	NOTE NO. 1 TO 12 DELETED AND NEW NOTE NO. 1 ADDED	-	01/25
2	-	59/04/24	NOTE NO. 11 & 12 ADDED	-	C2/24
1	-	55/06/23	1. NOTE NO. 8,9,10 ADDED AND NOTE NO. 3, 5 MODIFIED. 2. QUANTITY OF ITEM NO. 4 MODIFIED TO 2 NO. ACCORDINGLY DRAWING UPDATED.	-	11/23

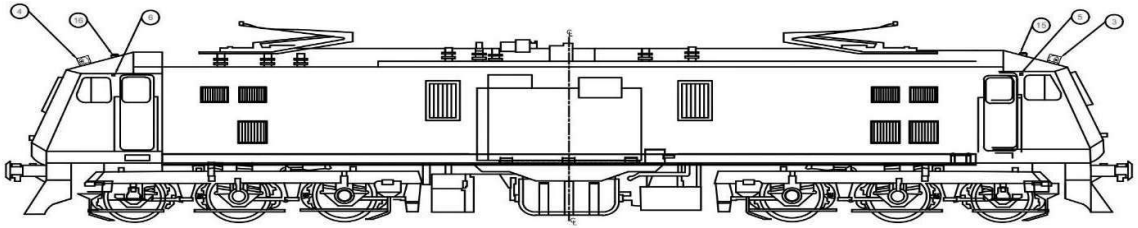
ASSEMBLY DRGS. | SUPERSEDED BY:- | SUPERSEDES:-
REFERENCE :-
SCALE
INDIAN RAILWAYS STANDARDS
ICF/RCF COACHES
STANDARD FIXING PRTOCOL FOR INSTALLATION OF CCTV SYSTEM IN ICF TYPE NON-AC COACHES
CDIC NO. :-K603
R.D.S.O.
CG-18232

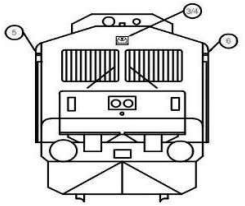
Guidelines for Electrical supply, safety and supplier's scope of work for provision of CCTV in Coaches.

1. The CCTV wiring in the coaches should be planned in such a way that it doesn't come in contact with power cable wiring. Coach type wiring diagram to be planned by the contractor for connecting camera and various equipment as indicated.
2. During installation following Electrical code of practices of should be followed for ensuring Electrical safety: - (i) RDSO Spec no. EL/TL/56-1992 (ii) RDSO Spec no. EL/TL/48(Rev-1)-2005 (iii) RDSO document no. RDSO/PE/0/0008-2005 Rev (0).
3. Power circuit wiring to be done as per guidelines of PS&EMU letter no. EL/0.6.2/SCC dated 04.12.2023.
4. Electrical supply to be taken from SBC and for this purpose 2 Amp MCB of suitable design to be provided by supplier.
5. Further, wiring from MCB at SBC to NVR unit is to be done in separate conduits for positive and negative supply.
6. Panic button is not be procured and fitted by supplier. However, all associated required wiring to be done by supplier for fitment of panic button at later stages.
7. General arrangement drawing for wiring diagram to be got approved by contractor from purchaser before execution.
8. For retro fitment in existing coaches, opening and re-fixing of various panel, provision of support plate for fixing CCTV equipment, cutting panels for accommodating and aesthetically sealing the same etc. and fixing arrangement of wiring to be kept in the scope of contractor.
9. Location of equipment given in drawing in indicative, slight modification may be done on suit at site basis as per available space in the coach.









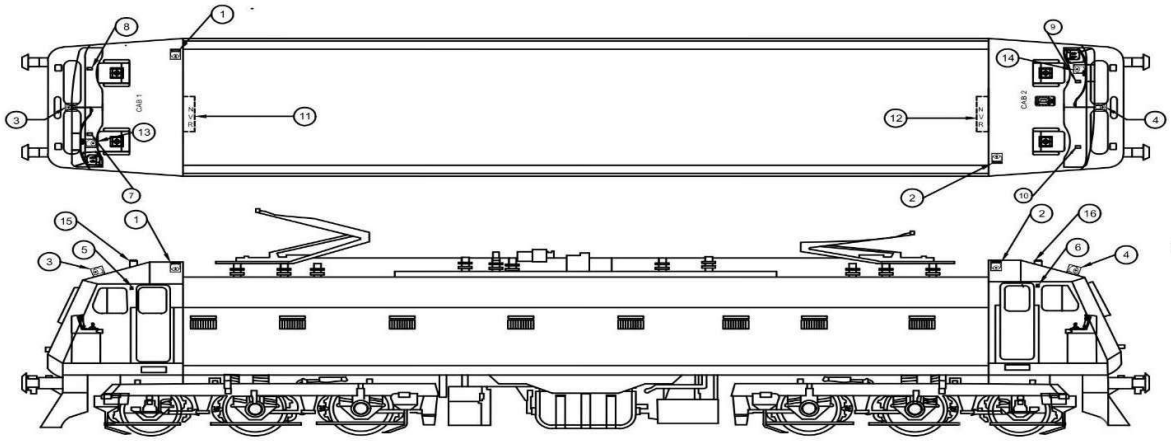
3-PHASE ELECTRIC LOCO

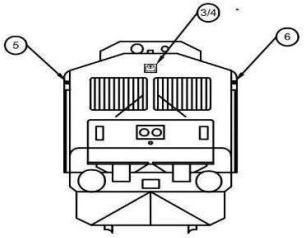
16	16	GPS Antenna on the top of Cab-2 roof
15	15	GPS Antenna on the top of Cab-1 roof
14	14	RDAS of cab-2 infront of LP
13	13	RDAS of cab-1 infront of LP
12	12	NVR in Cab-2
11	11	NVR in Cab-1
10	10	Micro Phone-4 in front of ALP for Cab-2
9	9	Micro Phone-3 in front of LP for Cab-2
8	8	Micro Phone-2 in front of ALP for Cab-1
7	7	Micro Phone-1 in front of LP for Cab-1
6	6	Side view of cab-2(Perpendicular to track on LP side
5	5	Side view of cab-1(Perpendicular to track on LP side)
4	4	Front side on roof of cab-2
3	3	Front side on roof of cab-1
2	2	Inside cab-2 (On cab roof behind ALP, adjacent to locomotive entry/exit door)
1	1	Inside cab-1 (On cab roof behind ALP, adjacent to locomotive entry/exit door)
S.N	Item No.	Location of Item

NOTE:
1. Location of Cameras,NVRs,RDAS, GPS Antenna & Microphones given in drawing is indicative,slight modifications may be undertaken in consultation with consignee as per available space in locomotive.
2. This installation scheme of VSS is also applicable to converted twin 3-phase electric locomotives like EF12K.
3. All VSS equipments mounted on locomotive should be within IRSOD, Diagram 1D.

DT.	
D	GIRISH MEENA
C	ARVIND PANDEY

REF. :	SCALE - NTS	APPD. BY (for DG)
PROPOSED INSTALLATION SCHEME OF VSS FOR 3-PHASE ELECTRIC LOCO		FIRST ISSUED
		SUPERSEDES
R.D.S.O. ELECT. DTE.	SKEL - 5084 Alt.3	SUPERSEDED BY





S.N	Item No.	Location of Item
16	16	GPS Antenna on the top of Cab -2 roof
15	15	GPS Antenna on the top of Cab -1 roof
14	14	RDAS of cab-2 infront of LP
13	13	RDAS of cab-1 infront of LP
12	12	NVR in Cab-2
11	11	NVR in Cab-1
10	10	Microphone-4 in front of ALP for Cab-2
9	9	Microphone-3 in front of LP for Cab-2
8	8	Microphone-2 in front of ALP for Cab-1
7	7	Microphone-1 in front of LP for Cab-1
6	6	Side view of cab-2(perpendicular to track on LP side)
5	5	Side view of cab-1(perpendicular to track on LP side)
4	4	Front side on roof of cab-2
3	3	Front side on roof of cab-1
2	2	Inside cab-2 (on cab roof behind ALP,adjacent to locomotive entry/exit door)
1	1	Inside cab-1 (on cab roof behind ALP,adjacent to locomotive entry/exit door)

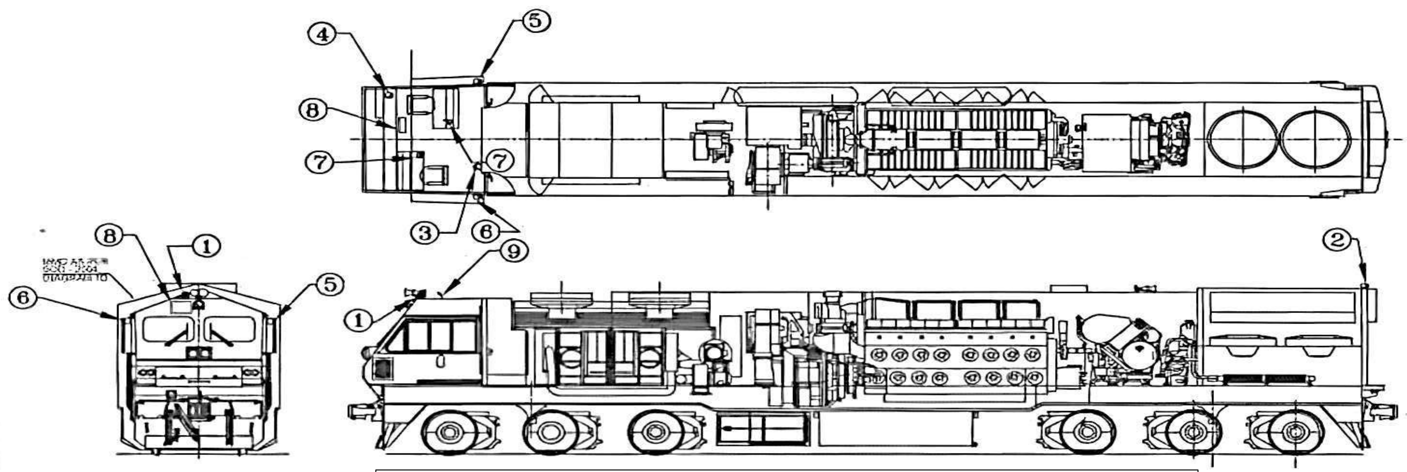
CONVENTIONAL ELECTRIC LOCO

NOTE:

1. Location of Cameras,NVRs,RDAS , GPS Antenna & Microphones given in drawing is indicative,slight modifications may be undertaken in consultation with consignee as per available space in locomotive.
2. This installation scheme of VSS is also applicable to converted twin Conventional electric locomotives like WAG10.
3. All VSS equipments mounted on locomotive should be within IRSOD, Diagram 1D.

DT.	GIRISH MEEN
D	A
C	ARVIND PANDEY

REF. :	SCALE: NTS	APPD. BY. (For Dg)	
PROPOSED INSTALLATION SCHEME OF VSS FOR CONVENTIONAL ELECTRIC LOCO			FIRST ISSUED / SUPERSEDES
R.D.S.O. ELECT. DTE.	SKEL -5085 Alt. 3		SUPERSEDED BY



WDP4, WDP4B, WDG4 & WDG6G SINGLE CAB LOCOS

NOTE–

1. THIS DRAWING INDICATES ONLY TENTATIVE LOCATION OF EQUIPMENTS OF IP BASED VIDEO SURVEILLANCE SYSTEM (VSS).
2. THE LOCATION OF CAMERAs,NVRs, AND MICROPHONES GIVEN IN DRAWING IS INDICATIVE, SLIGHT MODIFICATION MAY BE UNDERTAKEN IN CONSULTATION WITH CONSIGNEE AS PER AVAILABLE SPACE IN LOCOMOTIVE.
3. ALL VSS EQUIPMENTS MOUNTED ON LOCOMOTIVE SHOULD BE WITHIN IR SOD , DIAGRAM 1D.
4. THIS DRAWING IS APPLICABLE FOR WDP4, WDP4B, WDG4 & WDG6G SINGLE CAB LOCOS.

S.NO.	DESCRIPTION	NO./LOCO.	LOCATION
9	GPS ANTENNA	01	ON TOP OF CAB ROOF
8	NVR (NETWORK VIDEO RECORDER)	01	ON FRONT WALL OF CAB
7	MICROPHONE	02	ON DRIVER DESK
6	EXTERNAL VIEW CAMERA	01	90 DEGREE TO TRACK TO CAPTURE SIDE VIEW
5	EXTERNAL VIEW CAMERA	01	90 DEGREE TO TRACK TO CAPTURE SIDE VIEW
4	CAB VIEW CAMERA	01	INSIDE CAB
3	CAB VIEW CAMERA	01	INSIDE CAB
2	TRACK VIEW CAMERA	01	REAR SIDE ON RADIATOR ROOF
1	TRACK VIEW CAMERA	01	FRONT SIDE ON CAB ROOF

ALT	NO.OF PLACES	REF. NO.	DESCRIPTION	ALT.NOTE NO.	SIGN	DATE
1	–		DRAWING REVISED & REDRAWN	L3–232	Sd/	[illegible]

SCALE: NTS

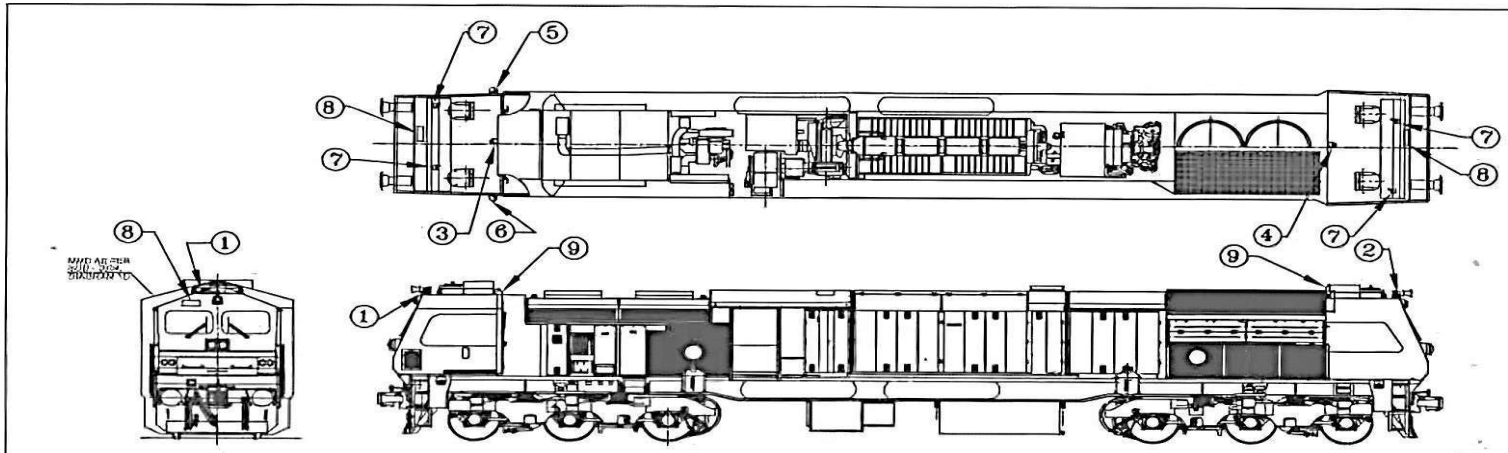
PROVISION OF VSS ON DIESEL LOCOMOTIVES

SKDP– 4163

FIRST ISSUED	SUPERSEDES	SUPERSEDED BY

D	HARSHIT SHUKLA
C	Sd/ [illegible]
APPD.	Sd/ VIKAS VERMA DIR/EC
Dt	Jan' 2025

NOT TO SCALE



NOTE–

1. THIS DRAWING INDICATES ONLY TENTATIVE LOCATION OF EQUIPMENTS OF IP BASED VIDEO SURVEILLANCE SYSTEM (VSS).
2. THE LOCATION OF CAMERAs,NVRs, AND MICROPHONES GIVEN IN DRAWING IS INDICATIVE, SLIGHT MODIFICATION MAY BE UNDERTAKEN IN CONSULTATION WITH CONSIGNEE AS PER AVAILABLE SPACE IN LOCOMOTIVE.
3. ALL VSS EQUIPMENTS MOUNTED ON LOCOMOTIVE SHOULD BE WITHIN IR SOD , DIAGRAM 1D.
4. THIS DRAWING IS APPLICABLE FOR WDP4D , WDG4D, WDG4G DUAL CAB LOCOS.

WDP4D, WDG4D & WDG4G DUAL CAB LOCOS

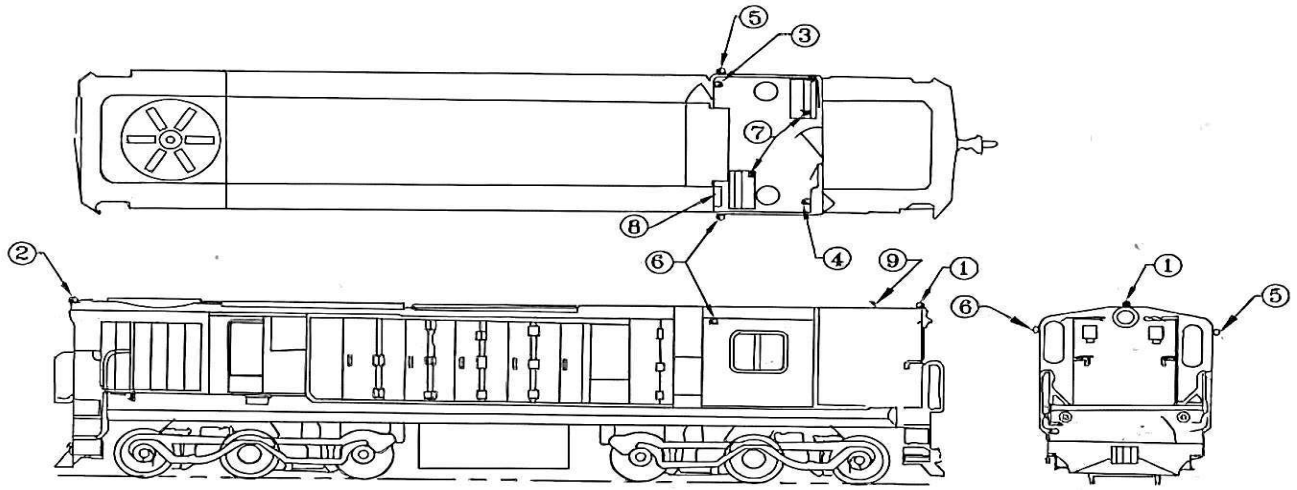
S.NO.	DESCRIPTION	NO. OF LOCO	LOCATION
6	EXTERNAL VIEW CAMERA	01	ON CAB 1 SIDE 90 DEGREE TO TRACK TO CAPTURE SIDE VIEW
5	EXTERNAL VIEW CAMERA	01	ON CAB 1 SIDE 90 DEGREE TO TRACK TO CAPTURE SIDE VIEW
4	CAB VIEW CAMERA	01	INSIDE CAB 2
3	CAB VIEW CAMERA	01	INSIDE CAB 1
2	TRACK VIEW CAMERA	01	FRONT SIDE ON CAB2 ROOF
1	TRACK VIEW CAMERA	01	FRONT SIDE ON CAB1 ROOF
9	GPS ANTENNA	02	ON TOP OF CAB ROOF (01 IN EACH CAB)
8	NVR (NETWORK VIDEO RECORDER)	02	ON FRONT WALL OF CAB (01 IN EACH CAB)
7	MICROPHONE	04	ON DRIVER DESK (02 IN EACH CAB)

ALT	NO.OF PLACES	REF. NO.	DESCRIPTION	ALT.NOTE NO.	SIGN.	DATE
1	–		DRAWING REVISED & REDRAWN	L3–233		25.03.2025

D	HARSHIT SHUKLA
C	KIRAN KUMAR DR/EC
APPD. Sd/	VIKAS VERMA DIR/EC
Dt	JAN'2025

NOT TO SCALE

SCALE: NTS	PROVISION OF VSS ON DIESEL LOCOMOTIVES	
	SKDP– 4164	
FIRST ISSUED	SUPERSEDES	SUPERSEDED BY



HOOD TYPE ALCO LOCOS

NOTE—

1. THIS DRAWING INDICATES ONLY TENTATIVE LOCATION OF EQUIPMENTS OF IP BASED VIDEO SURVEILLANCE SYSTEM (VSS).
2. THE LOCATION OF CAMERAs,NVRs, AND MICROPHONES GIVEN IN DRAWING IS INDICATIVE, SLIGHT MODIFICATION MAY BE UNDERTAKEN IN CONSULTATION WITH CONSIGNEE AS PER AVAILABLE SPACE IN LOCOMOTIVE.
3. ALL VSS EQUIPMENTS MOUNTED ON LOCOMOTIVE SHOULD BE WITHIN IR SOD , DIAGRAM 1D.
4. THIS DRAWING IS APPLICABLE FOR HOOD TYPE ALCO LOCOS.

S.NO.	DESCRIPTION	NO./LOCO.	LOCATION
6	EXTERNAL VIEW CAMERA	01	90 DEGREE TO TRACK TO CAPTURE SIDE VIEW
5	EXTERNAL VIEW CAMERA	01	90 DEGREE TO TRACK TO CAPTURE SIDE VIEW
4	CAB VIEW CAMERA	01	INSIDE CAB
3	CAB VIEW CAMERA	01	INSIDE CAB
2	TRACK VIEW CAMERA	01	REAR SIDE ON RADIATOR ROOF
1	TRACK VIEW CAMERA	01	FRONT SIDE ON CAB ROOF
9	GPS ANTENNA	01	ON TOP OF CAB ROOF
8	NVR (NETWORK VIDEO RECORDER)	01	ON REAR WALL OF CAB
7	MICROPHONE	02	ON DRIVER DESK

ALT	NO.OF PLACES	REF. NO.	DESCRIPTION	ALT.NOTE NO.	SIGN	DATE
1	—		DRAWING REVISED & REDRAWN	L3—234		15.09.2025

SCALE: NTS

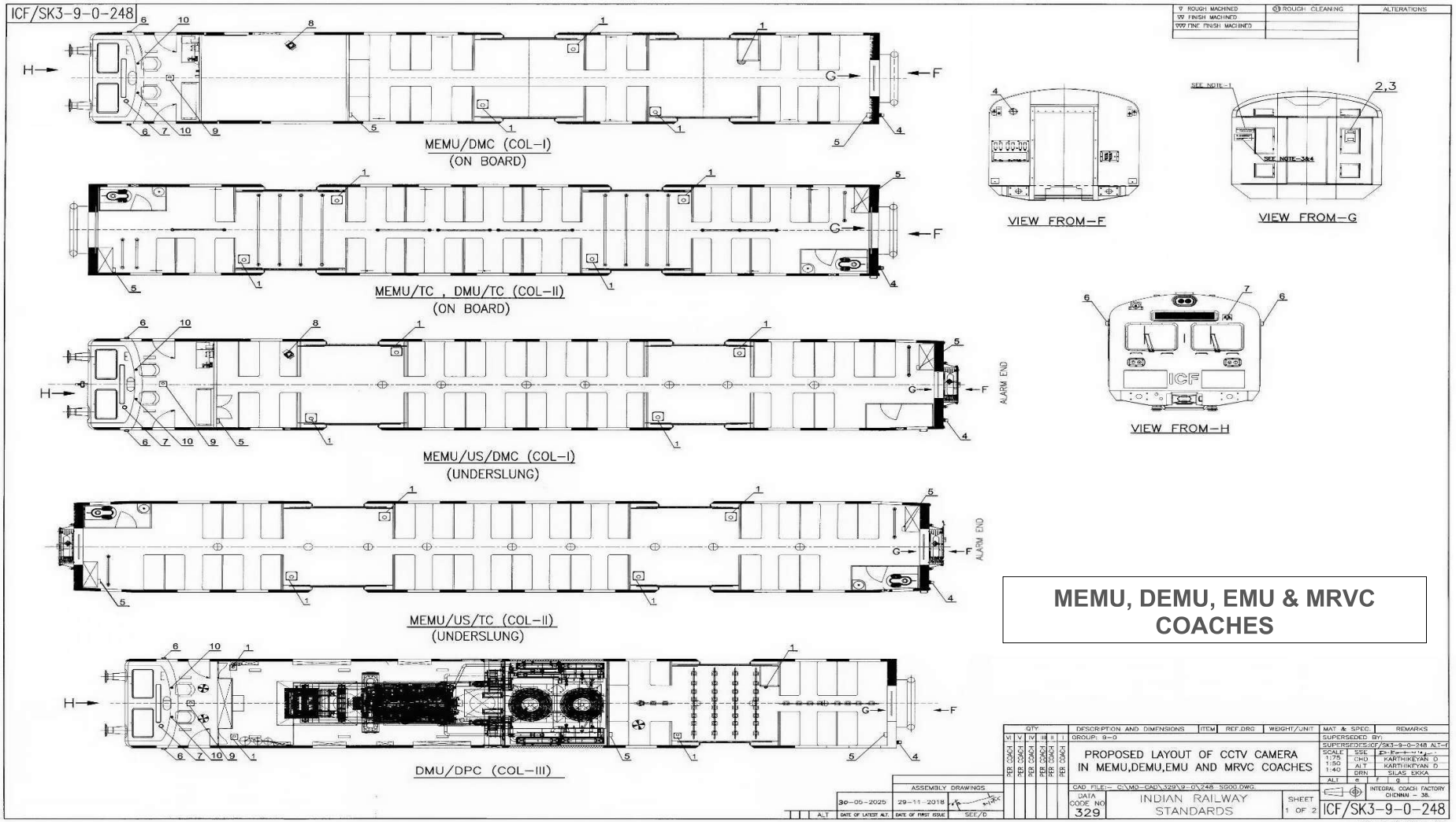
PROVISION OF VSS ON DIESEL LOCOMOTIVES

DRG. NO. SKDP— 4165

FIRST ISSUED | SUPERSEDES | SUPERSEDED BY

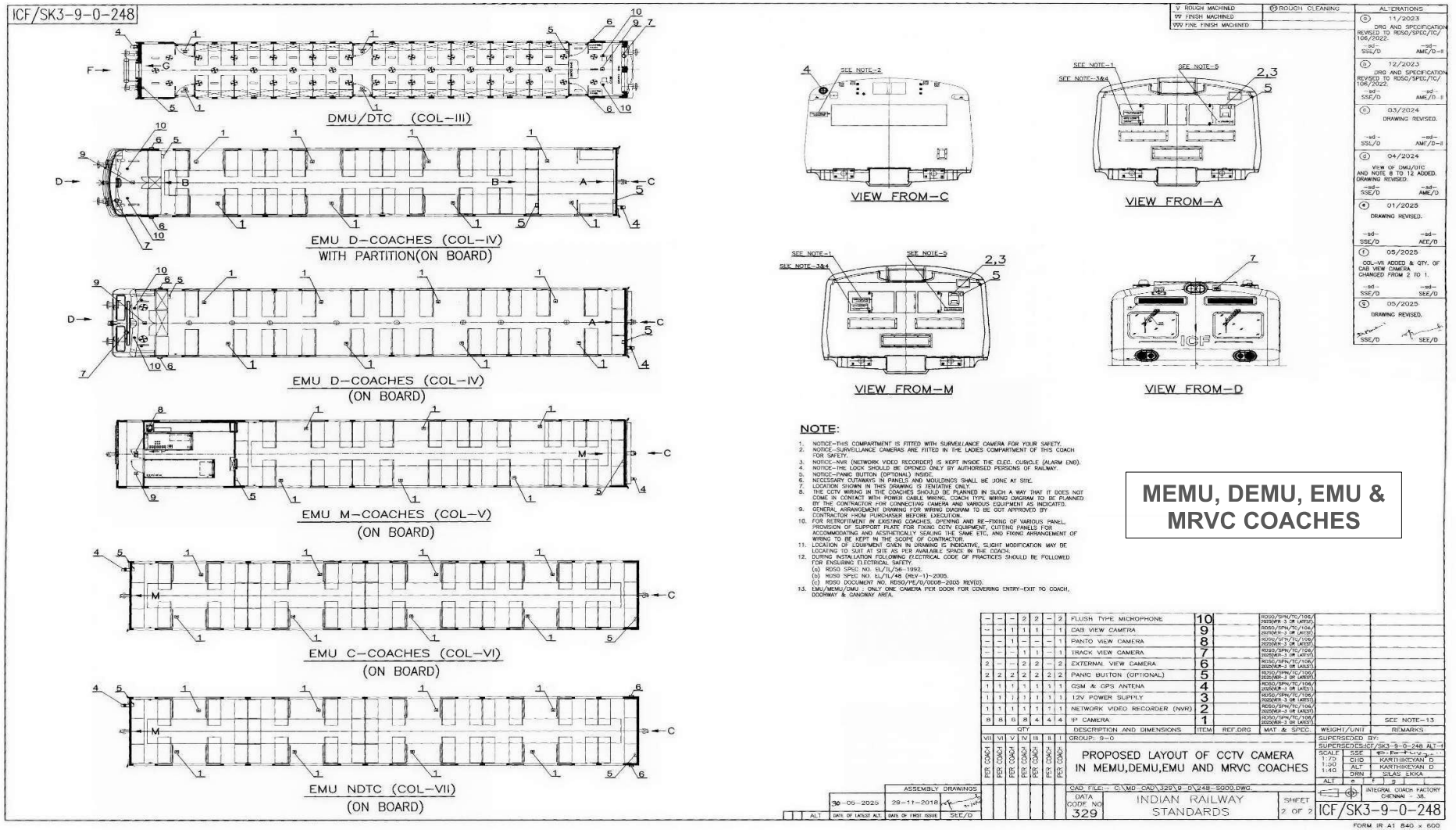
D	
C	
APPD.	Sd/ VIKAS VERMA DIR/EC
Dt.	JAN'2025

NOT TO SCALE


ICF/SK3-9-0-248
MEMU/DMC (COL-I)
(ON BOARD)
MEMU/TC , DMU/TC (COL-II)
(ON BOARD)
MEMU/US/DMC (COL-I)
(UNDERSLUNG)
MEMU/US/TC (COL-II)
(UNDERSLUNG)
DMU/DPC (COL-III)
VIEW FROM-F
VIEW FROM-G
VIEW FROM-H
ALARM END
MEMU, DEMU, EMU & MRVC COACHES
PROPOSED LAYOUT OF CCTV CAMERA IN MEMU,DEMU,EMU AND MRVC COACHES
INDIAN RAILWAY STANDARDS
ICF/SK3-9-0-248

3915971/2025/O/o ED/Tele-I/RDSO

ISO 9001-2015	RDSO/SPN/TC/106/2025	Version 3.1	Effective from 04.06.2025
Document Title: Specification for the item: IP Based Video Surveillance System for Rolling Stock of Indian Railways			



3915971/2025/O/o ED/Tele-I/RDSO

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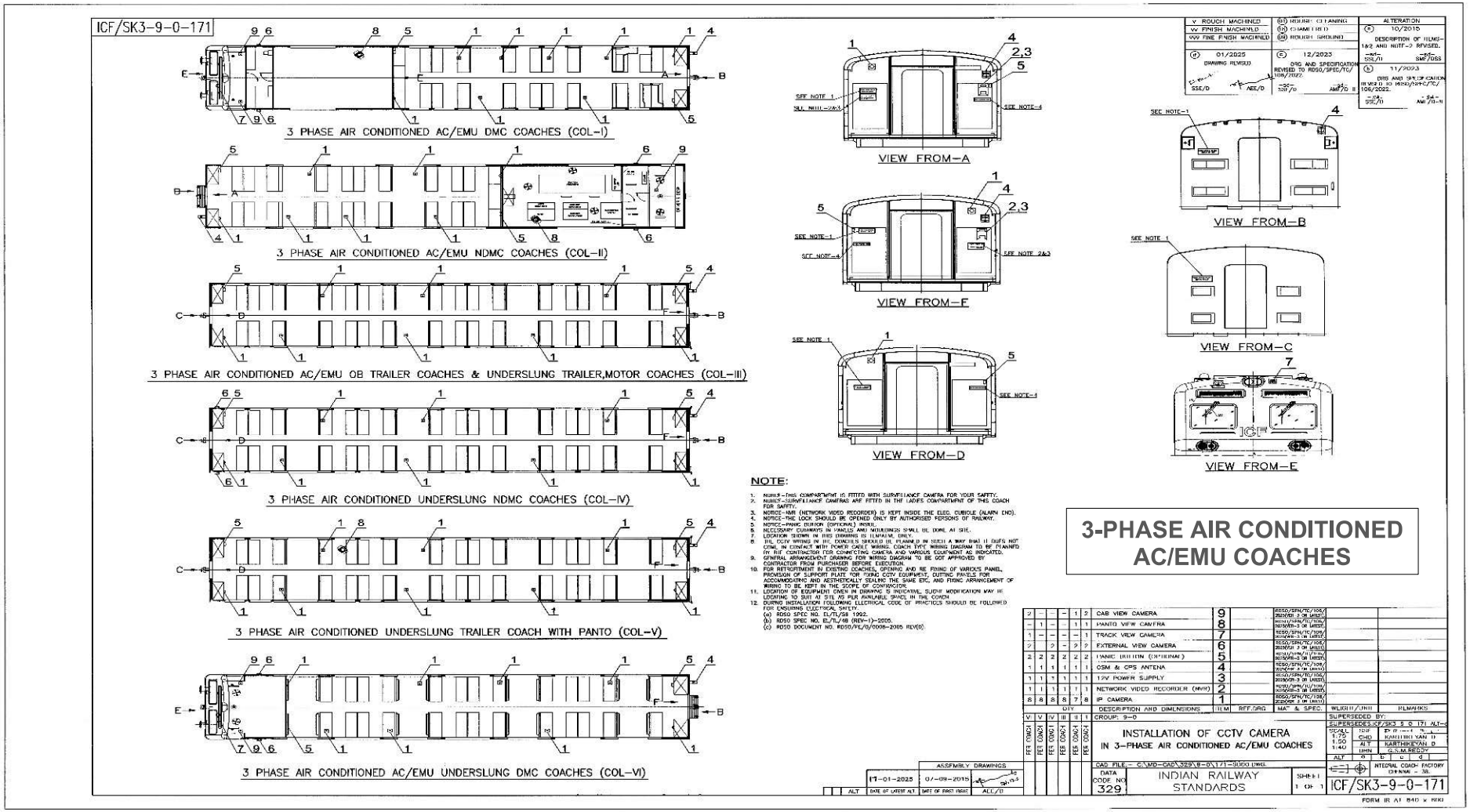

3915971/2025/O/o ED/Tele-I/RDSO

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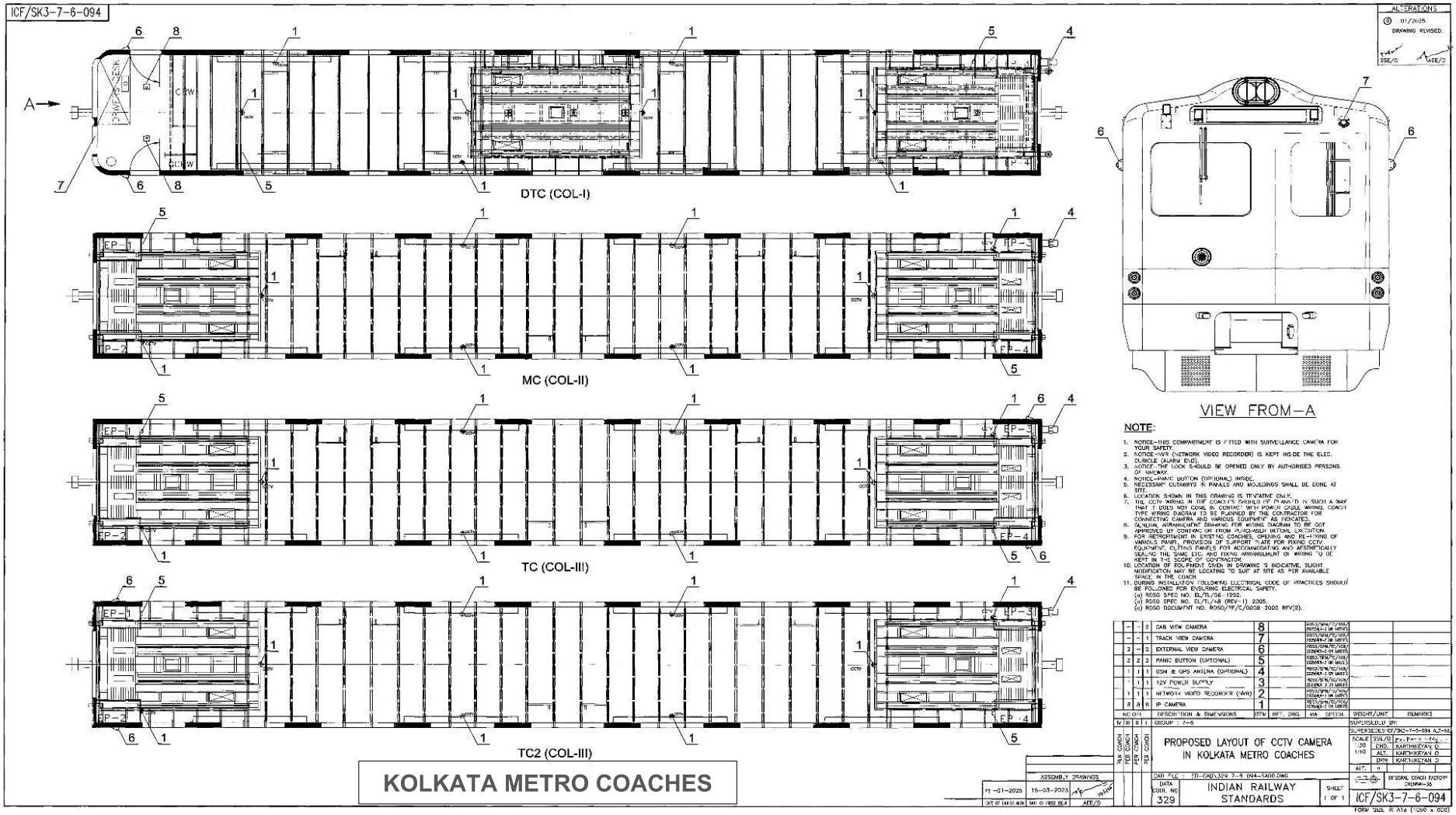

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