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**RDSO SPECIFICATION
FOR
IP BASED CLOSED CIRCUIT TELEVISION (CCTV) SURVEILLANCE
SYSTEM IN COACHES OF INDIAN RAILWAYS**

SPECIFICATION NO. RDSO/SPN/TC/106/2019

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**TELECOM DIRECTORATE
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<p>Title of Document</p> <p>RDSO Specification of IP based Closed Circuit Television (CCTV) Surveillance System in Coaches of Indian Railways</p>	
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<p>Approved by</p> <p>Executive Director/Telecom/RDSO</p>	
<p>Abstract</p> <p>This document specifies technical specification of IP based Closed Circuit Television (CCTV) Surveillance System in Coaches of Indian Railways</p>	

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I. SUMMARY:

This document covers the technical requirements of IP based Closed Circuit Television (CCTV) Surveillance System in Coaches of Indian Railways.

II. SOURCE:

1. Specification 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. Specification 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.

Specification of IP based Closed Circuit Television (CCTV) Surveillance System in Coaches of Indian Railways

RDSO Specification No. RDSO/SPN/TC/106/2019, Revision 1.0

1.0 SCOPE:

The Specification of IP based Closed Circuit Television (CCTV) Surveillance System in Coaches of Indian Railways covers technical specification and requirement of IP based CCTV Surveillance Systems in Coaches consisting of Fixed Dome IP colour Camera, Video Recorder Unit, Mobile NVR, System Software, Managed PoE Ethernet Switch either standalone or in built and Wi-fi Access Point either standalone or in built etc. for Surveillance in Coaches of passenger trains of Indian Railway.

2.0 SYSTEM DESCRIPTION:

- 2.1 Each Coach shall be installed with tentatively 8 nos. of Cameras. 4 nos. of Cameras shall be installed in doorways, 1 no. of camera facing each Vestibule portion and 2 nos. of Cameras shall be installed in aisle area.

Note: The above scheme is tentative and no. of cameras may vary as per type of Coaches or as specified by the purchaser.

- 2.2 Each Coach shall be provided with a Video Recorder Unit or Mobile Network Video Recorder (Mobile NVR) along with System Software.

- 2.3 The Video and Alarm data of Cameras shall be stored in the Video Recorder Unit/ Mobile NVR for at least 30 days at 25 FPS with Full HD resolution with H.265 or higher Video Compression.

- 2.4 Each Coach shall be provided with Wi-fi Access Point and LTE (4G), 3G for connecting the Video Recorder Unit/ Mobile NVR to the Data Centre/Centralized location/Cloud. Video Recorder Unit /Mobile NVR should be provided with GPS module for GPS applications within the housing as specified in clause 3.16.

- 2.5 The Cameras and Video Recorder Unit/ Mobile NVR of running trains shall be accessible on real time basis through available Wi-fi and LTE(4G)/3G network as and when required from Data Centre/ Centralized locations/ Clients for Viewing and Monitoring and Alarms.

- 2.6 It shall be possible to transmit the Alarms generated by Video Recorder Unit/ Mobile NVR of running trains and prompt to Data Centre/Centralized locations on real time basis through the available Wi-fi and LTE(4G)/3G network.

2.7 (i) There shall be provision of Panic Button/Buttons in each Coach. Pressing Panic Button shall provide local buzzer as well as alarm to the Data Centre/Centralized location through available network for CCTV application.

(ii) No. of Panic Buttons and its suitable location shall be decided by the purchaser as per requirement.

3.0 GENERAL REQUIREMENTS:

3.1 The Closed-Circuit Television (CCTV) Surveillance System shall be end to end IP (Internet Protocol) based.

3.2 The Video Surveillance system shall be based on non-proprietary open architecture where the System Software can work and integrate with any make of IT hardware.

3.3 The System i.e. Mobile NVR, IP cameras and System Software shall be compliant to global standards ONVIF Profile 'S' for the interface of network video product (ONVIF – Open Network Video Interface Forum). The quoted models should appear on the ONVIF website and a confirmation certificate for the offered models should be available at the time of supply.

3.4 The Railway Track/ Stations/ EMU Shed/Stabling Line/Washing Line/ Coaching depot may be provided with the high-speed Wi-fi or LTE(4G), 3G network. The Video Recorder Unit/ Mobile NVR shall have capability to automatically transmit the required data (video/face images/alarms etc.) from the Coaches to the Data Centre/Divisional Control/ Cloud on getting connected automatically to available Wi-fi or LTE (4G)/ 3G network.

3.5 If Required Data is not offloaded instantaneously through available Wi-fi network and/or 4G/3G network completely at first Station due to short stoppage time or network outage, it is required that timestamps are maintained in order to avoid duplication in transmission of data at next station(s).

3.6 In case of any disconnection/disruption in transmission of data, the Video Recorder Unit/Mobile NVR shall be able to resume the transmission when network gets connected without any duplication of the Video data in the Data Centre/Centralized location/Cloud.

3.7 Video Recorder Unit/ Mobile NVR installed in individual Coaches shall be provided with unique digital identification number. This shall be used as key identifier for Video Recorder Unit/ Mobile NVR while communicating to Data Centre/ Cloud through Wi-fi link or LTE (4G), 3G network. It shall be possible to change identification number of Video Recorder Unit/ Mobile NVR as per requirement while adding or deleting the coaches in trainset.

3.8 Central Management System (CMS) including VMS shall be deployed in Datacenter /Centralized Location/ Cloud or any other location as specified by the purchaser.

Centralized Management Servers with 1:1 redundancy (HA mode) in Datacenter /Centralized Location / Cloud shall be provided. CMS shall maintain a mapping of all train coaches and their respective Video Recorder Unit/ Mobile NVR associated with coach. Once an alert is generated, Central Server shall help in escalating a particular event to RFP's/Thana Posts using GPS location of the train.

- 3.9 Central Management System shall have a dashboard to display status of all requests pertaining to video footage by various RPF Thana/Post. CMS shall also provide a dashboard to respective RPF Thana/Post displaying status (in-progress/completed) of the requests created by that RPF Thana/Post.
- 3.10 On reception of incident from RPF Thana/Post, Central Server shall create an entry & will be responsible for fetching the recordings related with the incident from the respective Train Coach-Video Recorder Unit/ Mobile NVR once it becomes live in the network. Subsequently, system should send an alert and it should change the state from in-process to close state and an acknowledgement to be shared to the RPF Thana/Post.
- 3.11 Once the RPF Thana/Post sees completed status in the dashboard against a particular request, they should be able to view the required video footage. Client at RPF Thana/Post should also have the facility to flag/mark indicating the duration (time period) for which the video footage need to be retained along with justification/remarks for the same. System shall also display the list of video footage with details e.g. date, duration, video recording unit, train no., video file size) being stored for long term retention as desired by RPF officials.
- 3.12 The Video data at Data Centre/ Cloud shall be accessible to any other centralized location or other clients through MPLS/IP network as per requirement of purchaser for Viewing and Monitoring.
- 3.13 The Video Recorder Unit/ Mobile NVR shall provide secured recording for evidence purposes and user authentication to protect data integrity. Necessary provisions for Cyber Security required for the system at different levels shall be implemented based on the latest technology and as specified by the purchaser.
- 3.14 The power available in the Coach for Train lighting is 110V DC/ 110V AC (nominal). A Suitable Power Supply Unit conforming to EN 50155/ IEC 60571(For Temperature, Humidity, Vibration and UL/EN/IEC/BIS/CE/FCC as applicable for Safety and EMI/EMC) for Rolling Stock application shall be provided by the supplier to operate Video Recorder Unit/ Mobile NVR, Wi-fi Access Point and Managed PoE Ethernet Switch.
- 3.15 The Cameras shall be installed and fixed on Coach Ceiling. The equipments viz. Video Recorder Unit/ Mobile NVR, Wi-fi Access Point, LTE(4G), 3G Mobile communication equipment, GPS Module, Managed PoE Ethernet Switch and Power Supply etc. and other accessories shall be housed in concealed, powder coated

metal enclosure with suitable Ingress Protection for dust and water by providing gasket & sealing of cable entry/exit along with suitable lock and key as specified by the purchaser.

- 3.16 The dimension of metal enclosure shall be within 400(L)x300(B)x200(H)mm approximately so as to house the equipments in such a way that maintenance can be done without any difficulty. The metal enclosure should be such that it is able to dissipate heat generated by equipments.

4.0 TECHNICAL REQUIREMENTS: The technical requirements of different components shall be as below:

4.1 Full HD Fixed Dome type IP Colour Camera:

The camera shall have the following minimum specifications:

S. No.	Parameter	:	Specification
i.	Image Sensor	:	1/ 2.8" or larger, Progressive scan, CMOS Sensor
ii.	Video Compression	:	H.265 Streams or higher
	Audio Compression	:	G.711/G.722/G.726/AAC or similar
iii.	Resolution and Frame Rate	:	Full HD (1920x1080) resolution and 25 frames per second (FPS)
iv.	Minimum Illumination	:	0.3 Lux (Colour)
v.	Lens	:	Focal Length 2.8 mm or larger, IR corrected, 1 m minimum object distance, Auto IRIS Control suitable for Full HD Dome type IP Colour Camera.
vi.	Infra-Red	:	Built-in Infra-Red Illuminator with range 10 m or more
vii.	Wide Dynamic Range	:	≥ 90 dB
viii.	Network Connectivity & PoE	:	Ethernet, 10/100 Base T, IEEE 802.3af/at PoE compliant with M12/M23 connector
ix.	Video Streaming	:	Unicast and Multicast streams
x.	Discovery Interface	:	OEM interface to detect the camera automatically and configure network settings
xi.	Network Protocols	:	Suitable and required network protocol stack to work Camera in TCP/IP based Ethernet network environment. (As required for system working)

xii.	Web Server	:	Internal Web server required with embedded operating system.
xiii.	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.
xiv.	MAC Address	:	The MAC address of the IP cameras must be registered in the name of OEM supplying the Cameras.
xv.	Operating Temperature	:	0°C to +50°C or as specified by the purchaser
xvi.	Humidity	:	20% to 80% RH, Non-condensing or as specified by the purchaser
xvii.	Ingress Protection	:	IP 66
xviii.	Vandal Proof Casing	:	IK8 or higher
xix.	Regulatory Approvals/ Certifications	:	<p>a) EN 50155/IEC 60571 for Rolling Stock application for Temperature, Humidity and Vibration.</p> <p>b) UL/EN/CE/IEC/BIS for Equipment Safety and EN/IEC/CE/FCC/BIS for EMI & EMC</p> <p>c) ONVIF Profile 'S' for the interface of network video product (ONVIF – Open Network Video Interface Forum)</p> <p>Note: 1) For EN/IEC/UL/IS/CE/FCC, test certificate to be provided from internationally reputed and accredited test Labs/agencies or NABL/NABCB accredited Labs.</p> <p>2) EN/IEC Standards for Temperature, Humidity, Vibration and EMI/EMC which are part of EN 50155 or IEC 60571 are also applicable as EN 50155 / IEC 60571 Certification.</p>

4.2 Video Recorder Unit:

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

S. No.	Parameters	:	Specifications
i.	Processor*		Latest generation x86 Intel/ AMD Processor.

ii.	No. of Cores*	:	4 Core
iii.	Hardware Platform	:	PC
iv.	Operating System	:	Windows or Linux
v.	Camera type which is required to be supported	:	8 Nos., IP 2 Mega Pixel Full HD (1920x1080) Camera
vi.	Storage	:	HDD/SSD of minimum 8 TB Capacity.
vii.	GPS Module	:	Inbuilt (within the housing) GPS Module
viii.	Mobile Communication	:	Inbuilt (within the housing) LTE(4G), 3G Mobile communication with standard SIM Card slot with external antenna
ix.	Wi-fi Access Point	:	Inbuilt Wi-fi Access Point as per IEEE 802.11 b/g/n or 802.11 ac with 23 dBm or higher Antenna or External Wi-fi Access Point as per Clause no.4.4
x.	10/100 Base T Ethernet Interface	:	8 nos. or more 10/100 Base T, IEEE 802.3af/at compliant PoE with M12/M23 connector or External Managed PoE Ethernet Switch as per Clause no. 4.3
xi.	10/100/1000 Base T Ethernet Interface	:	As required for External Wi-fi Access Point and External Managed PoE Ethernet Switch with M12/M23 connector
xii.	Video Output/ Interface (optional)	:	HDMI/VGA/BNC
xiii.	I/O Interfaces	:	USB Port, Serial Interface
xiv.	Operating Temperature	:	0°C to +50°C or as specified by the purchaser
xv.	Humidity	:	20% to 80% RH, Non-condensing or as specified by the purchaser
xvi.	Regulatory Approvals / Certifications	:	<p>a) EN 50155/IEC 60571 for Rolling Stock application for Temperature, Humidity and Vibration.</p> <p>b) UL/EN/IEC/BIS for Equipment Safety and EN/IEC/CE/FCC/BIS for EMI & EMC</p> <p>Note: 1) For EN/IEC/UL/IS/CE/FCC, test certificate to be provided from internationally reputed and accredited test Labs/agencies or NABL/NABCB accredited Labs.</p>

		2) EN/IEC Standards for Temperature, Humidity, Vibration and EMI/EMC which are part of EN 50155 or IEC 60571 are also applicable as EN 50155 / IEC 60571 Certification.
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*** Note: In case the VRU has embedded system architecture with system on Chip (SOC) and microprocessor together, deviation can be accepted if full functionality is achieved.**

4.3 Managed PoE Ethernet Switch:

The PoE Ethernet Switch shall have the following minimum specifications or otherwise as specified by the purchaser:

S. No.	Parameters	:	Specifications
i.	No. of Ports	:	8 Ports or more
ii.	Ethernet Ports	:	a) 8 nos. or more 10/100 Base T, IEEE 802.3af/at compliant PoE with M12/M23 connector b) 02 No. 10/100/1000 Base T Ethernet interface with M12/M23 connector
iii.	Power Supply	:	The switch should be able to work on power provided as per clause 3.16.
iv.	Operating Temperature	:	0°C to +50°C or as specified by the purchaser
v.	Humidity	:	20% to 80% RH, Non-condensing or as specified by the purchaser
vi.	Regulatory Approvals / Certifications	:	a) EN 50155/IEC 60571 for Rolling Stock application for Temperature, Humidity and Vibration. b) UL/EN/IEC/BIS for Equipment Safety and EN/IEC/CE/FCC/BIS for EMI & EMC Note: 1) For EN/IEC/UL/IS/CE/FCC, test certificate to be provided from internationally reputed and accredited test Labs/agencies or NABL/NABCB accredited Labs. 2) EN/IEC Standards for Temperature, Humidity, Vibration and EMI/EMC which are part of EN 50155 or IEC 60571 are also applicable as EN 50155 / IEC 60571 Certification.

4.4 Wi-fi Access Point:

The Wi-fi Access Point from train to ground link shall have following minimum specifications or otherwise as specified by the purchaser:

S. No.	Parameter	:	Specification
i.	Ethernet Port	:	10/100/1000 Base T auto-sensing
ii.	Wi-Fi network	:	IEEE 802.11 b/g/n or 802.11 ac
iii.	Wi-Fi mode	:	Access point
iv.	Output Power	:	The maximum radiated power should be as specified by the WPC.
v.	Input Voltage	:	should be able to work on power provided as per clause 3.16
vi.	Ingress Protection	:	IP 66
vii.	Operating Temperature	:	0°C to +50°C or as specified by the purchaser
viii.	Humidity	:	20% to 80% RH, Non-condensing or as specified by the purchaser
ix.	Regulatory Approvals / Certifications	:	a) EN 50155/IEC 60571 for Rolling Stock application for Temperature, Humidity (20% to 80% RH, Non-condensing) and Vibration. b) UL/EN/IEC/BIS for Equipment Safety and c) EN/IEC/CE/FCC/BIS for EMI & EMC Note: 1) For EN/IEC/UL/IS/CE/FCC, test certificate to be provided from internationally reputed and accredited test Labs/agencies or NABL/NABCB accredited Labs. 2) EN/IEC Standards for Temperature, Humidity, Vibration and EMI/EMC which are part of EN 50155 or IEC 60571 are also applicable as EN 50155 / IEC 60571 Certification.

4.5 Mobile Network Video Recorder (Mobile NVR):

The Mobile Network Video Recorder shall have the following minimum specifications:

S. No.	Parameter	:	Specification
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i.	Channels	:	8 nos.
ii.	Processor*	:	Latest generation x86 Intel/ AMD Processor
iii.	Operating System	:	Embedded Windows or Linux
iv.	Camera type which is required to be supported	:	IP 2 Mega Pixel Full HD (1920x1080)
v.	Recording Resolution and Frame Rate	:	Full HD (1920x1080) @ 25 FPS
vi.	Supported Image Resolution	:	SD, HD and Full HD resolution
vii.	Compression		
	a) Video	:	H.265 or higher
	b) Audio	:	G.711/G.722/G.726/AAC or similar
viii.	Recording Bandwidth (Max.)	:	64 Mbps
ix.	Storage	:	HDD/SSD of minimum 8 TB Capacity.
x.	Network Protocols	:	Suitable and required network protocol stack to work Camera in TCP/IP based Ethernet network environment. (As required for system working)
xi.	Discovery Interface	:	OEM interface to detect the camera automatically and configure network settings
xii.	GPS Module	:	Inbuilt (within the housing) GPS Module
xiii.	Mobile Communication	:	Inbuilt (within the housing) LTE(4G), 3G Mobile communication interface with standard SIM Card Slot
xiv.	Wi-fi Access Point	:	Inbuilt Access Point, IEEE 802.11 b/g/n or 802.11 ac with 23 dBm or higher Antenna or External Wi-fi Access Point as per Clause no.4.4
xv.	10/100 Base T Ethernet Interface	:	Inbuilt 8 nos. or more 10/100 Base T, IEEE 802.3af/at compliant PoE with M12/M23 connector or External PoE Switch as per Clause no. 4.3
xvi.	10/100/1000 Base T Ethernet Interface	:	As required for External Wi-fi Access Point and External Managed PoE Ethernet Switch with M12/M23 connector
xvii.	Video Output/ Interface	:	HDMI/VGA/BNC

	(optional)		
xviii.	I/O Ports	:	USB Port, Serial Interface
xix.	Software Features	:	Software features shall be as per Clause no. 4.6 of the specification
xx.	Operating Temperature	:	0°C to +50°C or as specified by the purchaser
xxi.	Humidity	:	20% to 80% RH, Non-condensing or as specified by the purchaser
xxii.	Regulatory Approvals/Certifications	:	<p>a) EN 50155/IEC 60571 for Rolling Stock application for Temperature, Humidity and Vibration.</p> <p>b) UL/EN/IEC/BIS for Equipment Safety and EN/IEC/CE/FCC/IS for EMI & EMC</p> <p>Note: 1) For EN/IEC /UL/IS/CE/FCC, test certificate to be provided from internationally reputed and accredited test Labs/agencies or NABL/NABCB accredited Labs. 2) EN/IEC Standards for Temperature, Humidity, Vibration and EMI/EMC which are part of EN 50155 or IEC 60571 are also applicable as EN 50155 / IEC 60571 Certification.</p>

*** Note: In case the NVR has embedded system architecture with system on Chip (SOC) and microprocessor together, deviation can be accepted if full functionality is achieved.**

4.6 System Software:

The System Software shall have following minimum specifications or otherwise as specified by the purchaser:

- 4.6.1 Live display of cameras.
- 4.6.2 Recording of Video.
- 4.6.3 Playback of archived video.
- 4.6.4 Retrieval of archived video.
- 4.6.5 Configuration of system settings.
- 4.6.6 Configuration of Camera parameters.

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- 4.6.7 The software shall support multiscreen display on monitors.
- 4.6.8 The system software shall have following recording features:
 - 4.6.8.1 The Software shall support continuous recording, activity control recording, motion detection recording and Alarm and Trigger input recording etc.
 - 4.6.8.2 In case Video Recorder Unit/ Mobile NVR operation is interrupted, like power disconnection and once the Video Recorder Unit/ Mobile NVR is restarted, the Video Recorder Unit/ Mobile NVR shall automatically resume recording of cameras.
 - 4.6.8.3 The system software shall support network fault-tolerant recording such that if the network connection between Video Recorder Unit and Camera is unavailable, the Video Recorder Unit shall automatically recover when the connection is restored.
 - 4.6.8.3 Search and Export: The system software shall support recording search by camera, date and time, events etc. and support export of video clips to USB drives.
- 4.6.9 The system software shall maintain system log such as alarms, events and operator log etc.
- 4.6.10 It shall be possible for Video Recording Unit/ Mobile NVR to transfer and append the Video data to Server at Cloud/ Data Centre for the data if demanded.
- 4.6.11 The system software shall support user management such as authentication of user login, configuration of users and user access rights.
- 4.6.12 It shall be possible to access Cameras through Video Recording Unit/ Mobile NVR from Centralized location for diagnostic and management purpose.
- 4.6.13 Software such as Facial Recognition etc. as required by the purchaser shall run on the Cloud/ Data Centre and it should be possible to send alarms to central location through available network.
- 4.6.14 It shall be possible for system to transfer event-based video footage to the Data Centre/ Cloud through network during course of journey.
- 4.6.15 Camera Tampering (Camera Blinding) analytics shall be provided for each Camera. The Camera Tampering alert shall be sent over Wi-Fi or 4G (LTE)/3G network to Datacenter/ Cloud.
- 4.6.16 Face image cropping tool shall run on 4 CCTV cameras installed at 4 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 crop it which should meet the requirement of FRS. This face image with the metadata shall be sent over Wi-Fi or 4G (LTE)/3G network to Face matching Server at Datacenter/ Cloud for matching.

4.7 Facial Recognition System:

The Face Recognition Software shall be deployed on Servers at Data Centre/Cloud/Centralized location as specified by the purchaser with the following minimum requirements:

- 4.7.1 The Face Recognition Algorithm vendor should have participated in the latest NIST (National Institute of Standards and Technology, U.S. Department of Commerce), Face Recognition Vendor Test (FRVT) 1: N Evaluation. The benchmarking parameters such as acceptable Error rate/Ranking in NIST report as applicable may be specified by the purchaser. Proof of concept trials/ demo may be asked by the purchaser.
- 4.7.2 Database server as specified by the purchaser for Facial Recognition system in High Availability (HA) shall be hosted in Cloud/centralized location/Datacenter.
- 4.7.3 For processing of metadata generated from Video Recording Unit/Mobile NVR configured based on coach (unique) number in train coaches, adequate numbers of Face Matching Servers shall be provided at cloud/datacenter assuming a minimum load of 100 new faces per hour per coach. Central face matching engine shall have capability to process face matching request from the coaches sequentially with Queue management and load balancing for the matching request.
- 4.7.4 Matching response shall be available on web-based application which can be configured for individual users at railway stations, central location etc.
- 4.7.5 If the system detects any match then alerts carrying coach (unique) number, frame of the detected person etc. shall be sent to the Command Control Centre and nearest RPF Thana/Post via shortest route calculation using GPS location of the train through available Wi-Fi or 4G (LTE)/3G network.

4.8 Server Hardware (Data Centre): Server hardware at Data Centre for FRS (Face Matching) and Central Management System (including VMS) separately shall have the following minimum specifications:

S. No.	Parameter	:	Specification
i.	Processor	:	Latest Generation x86 Intel Xeon/ AMD Epyc Processor
ii.	No. of Cores & No. of Processors	:	Minimum 16 Cores in Single Processor or 2 nos. of 8 Core Processor (Dual Socket)
iii.	No. of Threads	:	2 Threads per Core
iv.	Frequency	:	2.1 GHz or higher
v.	Memory	:	32 GB or higher, DDR4 SDRAM or latest.

vi.	Operating System	:	Windows Operating System or Linux, latest with required no. of Client licenses as specified by the purchaser.
vii.	LAN/ Ethernet	:	Onboard/ on slot Gigabit Ethernet (RJ45) with Load Balancing and Fail over Support, IPv6 compliant.
viii.	Interface type	:	FC or iSCSI or SAS or FCoE or Ethernet interface for connecting External Storage device.
ix.	Disk Drive	:	Minimum 1.6 TB usable Hot Pluggable SSD/ SAS HDD (10000 RPM or higher)
x.	RAID Controller	:	RAID Controller with RAID 5 configuration.
xi.	DVD R/W Drive & USB Ports	:	DVD R/W Drive (internal) or USB 3.0 Ports
xii.	USB/ PS/2 mouse and keyboard	:	Required
xiii.	Power Supply	:	Redundant Hot-swappable power supply
xiv.	Fan configuration	:	Redundant Hot swappable Fan
xv.	Chassis Type	:	19" Rack mountable with sliding rails and fittings to install into a Rack.
xvi.	Any other additional item which fulfills the FRS solution without affecting the FRS requirements.		
xvii.	Regulatory Approvals/ Certifications	:	UL/EN/CE/IEC/BIS certification for Safety and CE/FCC Certifications for EMC & Immunity.

4.9 Various Types of Cables:

4.9.1 STP CAT-6 Cable:

Fire Retardant (as per IEC/EN 60332-1) STP (Shielded Twisted Pair) CAT-6 Cable shall be compliant with latest EIA/TIA-568-B.2-1 standard for CAT 6 cable with Fire Retardant as per IEC/EN 60332-1.

4.9.2 Electrical Power Cable:

Electrical Cable used in the Coach for Video Surveillance System shall meet RDSO specification ELRS/SPEC/ELC/0019, Rev. 3 Feb. 2017(or latest Revision).

5.0 SOFTWARE LICENSES:

Required number of Software licenses for Video Surveillance System in Coaches shall be as specified by purchaser.

6.0 TEST REQUIREMENTS:

- 6.1 Unless otherwise specified all tests shall be carried out at ambient atmospheric conditions.
- 6.2 Inspection and testing shall be carried out to the effect that all requirements of this specification are complied with.
- 6.3 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).
- 6.4 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).

6.5 TYPE TEST:

- 6.5.1 Cameras, Video Recorder Unit/ Mobile NVR and System Software along with required accessories shall be considered as one system.
- 6.5.2 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
 - ii) Endurance test
- 6.5.3 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.
- 6.5.4 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.
- 6.5.5 Test certificates along with test reports shall be submitted if the tests for Temperature, Humidity and Ingress Protection are already conducted on the equipment as per standards mentioned in the respective clauses of specification.
- 6.5.6 For Vibration, Equipment Safety, EMI/EMC, 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.
- 6.5.7 Any other tests shall be carried out as considered necessary by the inspecting authority.

6.6 ACCEPTANCE TEST:

6.6.1 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.

- i) Visual inspection and Performance test
- ii) Endurance test

6.6.2 **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
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

6.6.3 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.

6.6.4 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 for Rolling Stock application
- ii) UL/EN/CE/IEC/BIS for Equipment Safety
- iii) EN/IEC/CE/FCC/BIS for EMI & EMC
- iv) ONVIF Profile 'S'

6.6.5 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.

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

7.0 MARKING & PACKING:

7.1 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

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

8.0 INFORMATION TO BE SUPPLIED BY THE PURCHASER:

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

S. No.	Description	Quantity
i.	Fixed Dome Type IP Colour Camera	As specified by the purchaser
ii.	Video Recorder Unit	As specified by the purchaser
iii.	Managed PoE Ethernet Switch	As specified by the purchaser
iv.	Wi-fi Access Point	As specified by the purchaser
v.	Mobile NVR	As specified by the purchaser
vi.	System Software	As specified by the purchaser
vii.	1. Face Recognition Software (Acceptable benchmarking performance parameters to be specified by the purchaser). 2. Data Base server for FRS data	As specified by the purchaser
viii.	Server Hardware (Data Centre)	As specified by the purchaser
ix.	STP CAT-6 Cable	As specified by the purchaser
x.	Electrical Power Cable	As specified by the purchaser
xi.	Software License	As specified by the purchaser
xii.	Panic Button/Buttons	As specified by the purchaser
xiii.	Sets of Technical Manuals	As specified by the purchaser
xiv.	Any other item(s) required for Video Surveillance System.	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.