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RDSO SPECIFICATION

OF

IP BASED VIDEO SURVEILLANCE SYSTEM

SPECIFICATION NO. RDSO/SPN/TC/65/2009

Revision 1.0

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TELECOM DIRECTORATE

RESEARCH DESIGNS & STANDARDS ORGANISATION

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I. SUMMARY:

This document covers the technical requirements of IP Based Video Surveillance System to be provided at waiting hall, railway yards, workshops, reservation counter, parking area, main entrance/ exit, platforms, foot over bridges etc. of railway station and others railway establishments.

II. SOURCE:

Specification RDSO/ SPN/ TC/ 65/2009, Rev. 1.0 has been prepared by RDSO, Lucknow as per Railway Board letter No. 2005/Tele/WE/2 dated 18/08/2006 and 2009/Tele/WW/1/ISSR dated 22/04/2009.

III. FOREWORD:

RDSO/ SPN specification is issued as draft specification. This specification is circulated to customers/ Railways and field inspection units for comments. In the absence of IRS specification, procurement may be made as per RDSO/ SPN specification.

Wherever, reference to any specifications appears in this document, it shall be taken as a reference to the latest version of that specification unless the year of issue of the specification is specifically stated.

RESEARCH DESIGNS & STANDARDS ORGANISATION

MINISTRY OF RAILWAYS

MANAK NAGAR, LUCKNOW

Specification of IP Based Video Surveillance System

RDSO Specification No. RDSO/SPN/TC/65/2009 Revision 1.0

1.0 SCOPE:

1.1 The specification of Video Surveillance System covers technical specification and requirement of IP based Video Surveillance Systems consisting of indoor & outdoor fixed box type IP cameras, fixed dome type IP cameras, indoor & outdoor P/T/Z IP dome cameras, single/multi channel video encoders (for existing analog cameras), video management hardware & software, recording servers, switches, colour monitor etc. for surveillance of different locations of Railway stations and other establishments from centralized location at station.

1.2 Video Surveillance System shall be end to end IP based with IP cameras as per site requirement.

1.3 The recording of the video shall be on an open architecture, non-embedded based recording server from reputed manufacturers like IBM/HP/Dell/Sun/Fujitsu.

1.4 The system shall be able to work on both wired as well as wireless network. The wireless network is envisaged for extreme areas like, yards, foot over bridges and any other area in the station where cable is difficult to lay and maintain.

1.5 The entire system shall be based on non proprietary open architecture where the video management software can work and integrate with any make of IT hardware.

2.0 SYSTEM DESCRIPTION:

2.1 Video Surveillance System to be provided at stations and other railway establishment shall consist of fixed IP cameras, P/T/Z IP dome cameras, single/multi channel encoders (for existing analog cameras), recording servers and PC's to view on LCD monitors and associated ethernet cable, fiber cable, video cable, power cable, twisted pair cable etc.

2.2 It shall be possible to integrate the surveillance system using the existing LAN / WAN infrastructure on optical / microwave backbone network of Railways.

2.3 In IP based video surveillance system, the cameras shall be provided at different locations so that the output is available as ethernet and connected to the backbone to the control room.

2.4 Each camera shall have a video at 4 CIF (Common Intermediate Format) and 25 frames and a dual stream capability such that the viewing and recording at different resolutions and frames per second are possible.

2.5 IP based video surveillance system and cameras shall offer dual streams of H.264 video compression standards at 4 CIF, 25 fps simultaneously.

2.6 System shall provide secured recording for evidence purposes and user authentication to protect data integrity.

2.7 The storage device for recording shall be external and of standard make with RAID 5 protection.

2.8 The recording shall be preferably stored for at least 30 days at 2CIF, 25 frames per second. However the system should be capable of recording at 4 CIF 25 frames per second for all cameras.

2.9 Schematics of system architecture of IP based Video Surveillance System is shown in Diagram – 1.

3.0 GENERAL REQUIREMENTS:

3.1 Original Equipment Manufacturer (OEM) of video surveillance system shall have office in India. OEM or its authorized representative shall have service facility in India.

3.2 Manufactured products shall have quality system compliance and shall be UL or EN and FCC certified.

3.3 The video management software should be able to integrate the IT hardware of any make. All IP cameras and video management software should be from the same manufacturer as all these equipments communicate directly with each other.

3.4 All software and firmware upgrades shall be free of cost for a period of five years or as specified by purchaser. All the IP cameras shall be freely accessible and programmable from the control room.

3.5 It shall be possible to view any camera from the Divisional, Zonal Headquarters, Railway Board or any other locations at the time of emergency or when ever desired with no extra hardware & software. Connectivity for same shall be provided by Railways. Atleast 20 number of users' licenses (or as specified by

purchaser) shall be provided to view a camera from anywhere using the network viewing management software.

3.6 Every control room of surveillance system shall be capable of getting connected to the optical or other communication backbone of Railways.

3.7 The power supply available at the stations shall be 230 V / 50 Hz AC which may vary from 160 Volts to 270 Volts. All modules of the surveillance system should work using this power supply only with requisite converters & voltage stabilizers of suitable capacity, if required.

3.8 All the cameras and other modules of video surveillance system shall be modular in construction. In case of up gradation of such modules in future, it shall be possible to upgrade them without replacing the entire product.

3.9 The system should have diagnostics facility for serial, video & network interfaces. System logging shall be possible either to a remote IP address or console port or on the system.

4.0 TECHNICAL REQUIREMENTS:

4.1 IP based Video surveillance System for all type of stations should mainly consist of the following:

i.	High resolution fixed box type IP colour camera with vari focal lens along with housing and mount as per clause 5.1.
ii.	High resolution fixed dome type IP colour camera as per clause 5.2.
iii.	P/T/Z dome IP colour camera as per clause 5.3.
iv.	Single/multi channel video encoder to convert existing analog camera to IP enabled camera as per clause 5.4.
v.	Wireless Transmitter/Receiver Unit for yards as per clause 5.5.
vi.	40” LCD monitor for monitoring on large screen as per clause 5.6.
vii.	20” LCD monitor for workstations as per clause 5.7.
viii.	Digital keyboard for P/T/Z functionality as per clause 5.8.
ix.	PC Work Station for viewing, monitoring & system management as per clause 5.9.
x.	Server Hardware for Network Video Management & Recording as per clause 5.10.
xi.	External Storage Device with RAID 5 as per clause 5.11.
xii.	Layer 2 Field Switch as per clause 5.12.
xiii.	Layer 3 Switch for the control room as per clause 5.13.
xiv.	UPS System as per clause 5.14.
xv.	Various types of cables as per clause 5.15.
xvi.	Accessories for terminating optic fiber cables as per clause 5.16.
xvii.	Copper to Fiber Media Convertor as per clause 5.17.

xviii.	Network Video Management Software as per clause 6.1.
xix.	Network Video Recording Software as per clause 6.2.
xx.	Video Analytics Software as per clause 6.3.
xxi.	Graphical User Interface Client Software features as per clause 6.4.
xxii.	Licensing as per clause 6.5.

4.2 Fixed box type IP colour cameras should preferably be provided in parking area, entrance/exit points, platforms, yards etc. or any other locations as decided by purchaser.

4.3 Fixed dome type IP colour cameras should preferably be provided in waiting halls, ticket counters, offices etc. or any other locations as decided by purchaser.

4.4 High speed P/T/Z IP dome cameras should preferably be provided in parking area, circulating area, platforms, foot over bridges etc. and for general perimeter surveillance or any other locations as decided by purchaser.

4.5 Wireless system should preferably be used for yards, where laying & maintenance of cabling is difficult. As far as possible optical fiber network shall be used.

4.6 For video surveillance system, there shall be required number of workstations for monitoring, one server for video management and required number of servers for video recording along with external storage array with RAID 5 protection for recording all the cameras. Minimum 16 cameras should be preferably viewed on one large monitor or as specified by purchaser.

4.7 At locations where video surveillance systems of multiple stations are to be viewed from one centralized location, the video surveillance system shall be integrated with the available backbone of the railways, details of which shall be provided by railways. The vendor shall supply all the necessary interface equipments required for such integration.

4.8 At each location of video surveillance system, there shall be a local control room with provision for monitoring & controlling cameras, recording and playback.

4.9 Administrator of centralized control room shall have right to create or delete any user from the system.

4.10 The Administrator shall be able to allow or deny a user access to some specified camera/ control and playback at any given point of time.

4.11 Administrator shall be able to access the recorded video of any location from his PC.

4.12 CAT-6 cable shall be laid between IP cameras and switches installed in the field. From field switches, optical fiber cable is to be laid to central switch. If distance between field switch & central switch is less than 90 meters, CAT-6 cable may also be used. The field switches shall have 10/100/1000 SFP port for fiber interface for switch to switch connectivity. All field switches should be connected to central switch in star configuration. Media converter can be used for fiber connectivity to remote IP camera.

4.13 Separate power cable is to be laid from central location to each platform, concourse, foot over bridges etc. for powering all the cameras and other devices installed in the field.

4.14 Monitoring & viewing work stations, video management server, recording server, storage device, central switch & UPS are to be kept in the main control room in AC environment.

4.15 All the equipment installed in outdoor conditions shall be housed in IP 66 enclosure and such electronic items shall be able to withstand 0^0 C to $+50^0$ C (with or without housing) and humidity of 80% RH non-condensing.

4.16 Suitable housing enclosures fitted with heater & blower kit shall be provide to all outdoor equipments i.e. IP cameras, switches, encoders etc. to satisfactory work upto temperature of -10^0C, if required due to local weather conditions and specified by purchaser.

4.17 The system shall support activity controlled frame rate control. This is required to automatically adjust frame rate depending on motion & scene. During periods of negligible motion, the frame rate should drop to 1fps and when motion occurs, the frame rate should return to 25 fps within 100 millisecond.

4.18 The system shall be compliant to global standard ONVIF (Open Network Video Interface Forum) or PSIA (Physical Security Interoperability Alliance's) for the interface of network video products.

5.0 HARDWARE REQUIREMENTS:

The Video Surveillance System shall mainly consist of:

5.1 High Resolution Fixed Box Type IP Colour Camera:

5.1.1 High resolution IP colour camera shall be of fixed box type suitable for indoor & outdoor surveillance during day or low light (night) operation.

5.1.2 The camera shall work on 220V AC voltage/ 24V AC/12VDC.

5.1.3 The camera shall meet the following minimum technical requirements.

i.	Pick-up device	:	1/3“ or 1/4" format, interline transfer/ progressive scan, CCD image sensor
ii.	Dual Stream	:	Dual H.264 Streams
iii.	Resolution and Frame Rate	:	Both the H.264 streams simultaneously shall be programmable for different frame rate per channel at 4/2/1 CIF resolutions at 25 fps.
iv.	Video resolutions	:	Configurable. 704 x 576 (4 CIF) 704 x 288 (2 CIF) 352 x 288 (1 CIF)
v.	Video Compression		H.264
vi.	Sensitivity	:	(Scene Illumination) (at F1.2, 50 IRE, Shutter Speed 1/50)
a.	Colour Mode	:	0.5 Lux
b.	Night Mode (Black & White)	:	0.05 Lux
vii.	Signal to Noise Ratio	:	≥ 50 dB
viii	Shutter speed		1 to 1/1,00,000
ix.	Active Pixels	:	752(H) X 582(V)
x.	Data rate	:	64 Kbps to 6 Mbps
xi.	Video Standard	:	PAL
xii.	Lens mounting	:	CS
xiii.	Operating Temperature	:	0 °C to +50 °C (with or without housing)
xiv.	Humidity	:	20% to 80% non-condensing
xv.	Approval	:	UL or EN & FCC standards for Safety, EMC & Immunity.
xvi.	Network Protocols	:	RTP, Telnet, TCP, IP, UDP, HTTP, IGMP v2/v3, ICMP, ARP, SNMP, FTP, Multicast. (as required for system working)
xvii.	PoE	:	IEEE 802.3af compliant
xviii.	Alarm Inputs / outputs	:	1 input & 1 output
xix.	Network Connectivity	:	Ethernet, 10/100Base T PoE
xx.	Web Server	:	Internal Web server required with embedded operating system.

xxi.	Automatic Gain Control	:	Required
xxii.	Automatic White Balance	:	Required
xxiii.	Back light Compensation	:	Required

5.1.4 Varifocal Lenses:

5.1.4.1 Varifocal Lenses of IR corrected 7.5 mm to 50 mm with following minimum specifications shall be used for fixed box type camera.

I	Focal length	:	7.5 – 50 mm IR corrected
ii.	Iris range	:	F1.7 to 360 , Auto
iii.	Min. Object Distance	:	1 m
iv.	Back focus distance	:	5 mm
v.	Lens mount	:	CS-mount
vi.	Iris Control	:	Auto, DC control
vii.	Focus Control	:	Manual
viii.	Zoom Control	:	Manual
ix.	Operating Temperature	:	0° C to +50 ° C
x.	Operating Humidity	:	20% to 80% non-condensing

5.1.5 Housing Arrangement for Fixed Box Type IP Camera:

5.1.5.1 Housing arrangement shall be designed for both outdoor and indoor use and should meet customer requirements for camera enclosures.

5.1.5.2 It shall protect camera and lens combination.

5.1.5.3 The housing arrangement shall have the following minimum technical specifications and features:

i.	Window	:	3 mm (0.12 inch) glass
ii.	Camera Mounting	:	Removable camera/lens tray, mounted with two screws.
iii.	Construction	:	Aluminum housing & casing, neoprene gaskets, UV-resistant polymer end caps.

iv.	Tamper-resistance	:	Tamper-resistant screws for locking clasps shall be provided.
v.	Enclosure Protection	:	IP 66, NEMA-4 or better, with inbuilt heater blower kit
vi.	Approvals	:	UL or EN & FCC standards for Safety, EMC & Immunity.

5.1.6 Mount:

5.1.6.1 Mounts shall be suitable for indoor and outdoor mounting units designed for fixed cameras or camera housing installations. The mounts shall be of the same make as housing.

5.1.6.2 Mount should have following minimum features:

a). Feed-through design for cable management
b). 360 deg rotation, 180 deg tilt
c). Versatile design
d). Adjustable mount heads
e). Corrosion-resistant finish

5.2 High Resolution Fixed Dome Type IP Colour Cameras:

5.2.1 High resolution IP colour camera shall be of fixed dome type suitable for indoor/outdoor surveillance.

5.2.2 The camera shall work on 220V AC voltage/ 24V AC/12VDC.

5.2.3 The camera shall meet the following minimum technical requirements.

i.	Pick-up device	:	1/3“ or 1/4" format, interline transfer/ progressive scan, CCD image sensor
ii.	Dual Stream	:	Dual H.264 Streams
iii.	Resolution and Frame Rate	:	Both the H.264 streams simultaneously shall be programmable for different frame rate per channel at 4/2/1 CIF resolutions at 25 fps.
iv.	Video resolutions	:	Configurable. 704 x 576 (4 CIF) 704 x 288 (2 CIF) 352 x 288 (1 CIF)
v.	Sensitivity	:	(Scene Illumination) (at F1.2, 50 IRE, Shutter Speed 1/50)
a.	Colour Mode	:	0.5 Lux
b.	Night Mode (Black & White)	:	0.05 Lux

vi.	Signal to Noise Ratio	:	≥ 50 dB
vii.	Active Pixels	:	752(H) X 582(V)
viii.	Data rate	:	64 Kbps to 6 Mbps
ix.	Video Standard	:	PAL
x.	Lens	:	3.8mm - 8mm
xi.	Enclosure		IP 54, NEMA- 3 or better
xii.	Operating Temperature	:	0 °C to +40 °C
xiii.	Humidity	:	20% to 80% non-condensing
xiv.	Approval	:	UL or EN & FCC standards for Safety, EMC & Immunity.
xv.	Network Protocols	:	RTP, Telnet, TCP, IP, UDP, HTTP, IGMP v2/v3, ICMP, ARP, SNMP, FTP, Multicast. (as required for system working)
xvi.	PoE	:	IEEE 802.3af compliant
xvii.	Alarm Inputs / outputs	:	1 input & 1 output
xviii.	Network Connectivity	:	Ethernet, 10/100Base T PoE
xix.	Web Server	:	Internal Web server required with embedded operating system.
xx.	Automatic Gain Control	:	Required
xxi.	Automatic White Balance	:	Required
xxii.	Back light Compensation	:	Required

5.3 High Speed P/T/Z IP Colour Camera (Day/Night):

5.3.1 The camera shall have PAN, Tilt and Zoom feature suitable for indoor and outdoor surveillance.

5.3.2 The camera shall have a 1/3“ or 1/4" CCD with minimum 35X optical zoom & 12X digital zoom.

5.3.3 The camera shall work on 220V AC voltage/ 24V AC/12VDC.

5.3.4 The camera shall meet the following minimum technical requirements.

i.	Pick-up device	:	1/3“ or 1/4" format, CCD image sensor
ii.	Dual Stream	:	Dual H.264 Streams

iii.	Resolution and Frame Rate	:	Both the H.264 streams simultaneously shall be programmable for different frame rate per channel at 4/2/1 CIF resolutions at 25 fps.
iv.	Video resolutions	:	Configurable. 704 x 576 (4 CIF) 704 x 288 (2 CIF) 352 x 288 (1 CIF)
v.	Video Compression		H.264
vi.	Signal to Noise Ratio	:	≥ 50 dB
vii.	Active Pixels	:	752(H) X 582(V)
viii.	Data rate	:	64 Kbps to 6 Mbps
ix.	Video Standard	:	PAL
x.	Operating Temperature	:	0^0C to +50^0C
xi.	Humidity	:	20% to 80% non-condensing
xii.	Horizontal resolution	:	460TVL.
xiii.	Network Protocols	:	RTP, Telnet, TCP, IP, UDP, HTTP, IGMP v2/v3, ICMP, ARP, SNMP, FTP, Multicast. (as required for system working)
xiv.	Alarm Inputs / outputs	:	One input & one output
xv.	Network Connectivity	:	Ethernet, 10/100Base T
xvi.	Web Server	:	Internal Web server required with embedded operating system.
xvii.	Approval	:	UL or EN & FCC standards for Safety, EMC & Immunity.
xviii.	Aperture correction	:	Horizontal & Vertical
xix.	Lens	:	35X optical zoom or better
xx.	Digital zoom	:	12X or better
xxi.	Shutter Speed	:	1 to 1/10,000.
xxii.	Focus & Iris	:	Automatic with manual override
xxiii.	Sensitivity	:	(Scene Illumination) (at F1.2, 50 IRE, Shutter Speed 1/50)
(a)	Day mode	:	0.1 Lux

(b)	Night mode (Black and White)	:	0.01 Lux
xxiv.	Pan/Tilt adjustment	:	360° continuous pan; 0^0 to 90° tilt from horizontal plane
xxv.	Preset speed	:	90°/sec ± 0.50° accuracy
xxvi.	Pan/Tilt speed	:	1°/sec to 90°/sec
xxvii.	Sector Blanking	:	Required. Camera 360 degree pan rotation to be divided in 8 sectors and any sector should be blanked as required by the operator
xxviii.	Preset Titling	:	The camera shall allow the storage of up to 99 preset scenes with each preset programmable for 16 character titles.
xxix.	Housing rating	:	Wall/ Pipe Mount, IP 66, NEMA 4 or better with inbuilt heater & blower kit or better, vandal proof dome and aluminium enclosure.
xxx.	Vandal Proofing	:	The bubble should be scratch resistant & vandal proof, it shall also be impact resistant as per IEC standard.

5.4 Encoder:

5.4.1 Single channel/multi channel encoder shall be provided to make the configuration IP enabled for existing analog cameras.

5.4.2 The encoder shall have following minimum specifications:

i.	Dual Stream	:	Dual H.264 Streams
ii.	Resolution and Frame Rate	:	Both H.264 streams simultaneously shall be programmable for different frame rate per channel at 4/2/1 CIF resolutions at 25 fps.
iii.	Video resolutions	:	Configurable. 704 x 576 (4 CIF) 704 x 288 (2 CIF) 352 x 288 (1 CIF)
iv.	Video Compression		H.264
v.	Network Protocols	:	RTP, Telnet, TCP/IP, UDP, HTTP, IGMP, ICMP, ARP, SNMP, 802.1 x, Encryption TLS 1.0, SSL, SNMP, FTP, Multicast. (as required for system working)
vi.	Video Data Rate	:	64 Kbps to 6 Mbps per channel

vii.	Alarm Inputs / outputs	:	At least 1 each for each camera input
viii.	Network Connectivity	:	Ethernet, 10/100Base T and PoE
ix.	SFP Port	:	1 Gbps, SFP
x.	Web Server	:	Internal Web server required with embedded operating system.
xi.	Approval	:	UL or EN & FCC standards for Safety, EMC & Immunity.
xii.	Operating Temperature	:	0 °C to +50 °C
xiii.	Humidity	:	0% to 80% non-condensing
xiv.	PTZ protocols	:	The encoder should support multiple PTZ protocols including the one for the associated analog PTZ camera.
xv.	PoE	:	IEEE 802.3af compliant

5.5 Wireless Transmitter/Receiver Unit:

5.5.1 Wireless Transmitter/Receiver Unit shall be used to send IP video signals from cameras to central location switch from extreme areas like, yards, foot over bridges and any other area in the station where cabling is difficult to install & maintain.

5.5.2 Wireless transmitter/receiver unit should consist of wireless transmitter or subscriber module, wireless receiver or access point and cluster management module.

5.5.3 Wireless transmitter or subscriber module shall be mounted near the camera for transmitting the video signal from the camera to the central location. A subscriber module should be designed to take inputs from a single camera or more than one camera depending on the location of cameras and the transmitting unit.

5.5.4 Wireless receiver or access point should be used to receive signals from all subscriber modules within the antenna beam width of 60^0 or more. A total of six such antennas or less depending upon antenna beam width will be required to give 360^0 coverage to the central location. A single access point should be designed to take inputs from a single subscriber module or multiple subscriber modules. For point to point connections, point to point radios or backhaul modules should be used.

5.5.5 A suitable mechanism of management modules should be used for managing various wireless links to ensure proper working of system. These modules should be within the integrated radio antennas or external depending on the total number of wireless transmitters and receivers.

5.5.6 Transmitter/Receiver Unit shall be of standard make and shall work preferably in unlicensed frequency band of 2.4 GHz/ 5.8 GHz. Transmitter/Receiver Unit shall be preferably Motorola or Alvarion or Radwin make or any other standard make as specified by purchaser.

5.5.7 Wireless Transmitter/Receiver Unit shall enable digital transmission of both video & data for PTZ control over the same frequency channel. It should be compact in design and shall be easily integrated with fixed and PTZ cameras.

5.5.8 Outdoor Unit of Transmitter/Receiver Unit shall be weatherproof with enclosure of rating IP 66/ NEMA 4 with all external connector for easy installation.

5.5.9 Minimum available aggregate bandwidth between remote location and central location should not be less than 14 Mbps with aerial distance of 12 Km which shall be increased depending upon transmission requirements.

5.5.10 Wireless Transmitter/ Receiver Unit shall meet the following minimum requirements.

S.N.	Specification	Transmitter Unit	Receiver Unit
i.	Signaling Rate	10 Mbps (Min.)	10 Mbps (Min)
ii.	Typical Line Of Sight Range	20 KM	20 KM
iii.	Typical Aggregate Useful Bandwidth	25 Mbps (Minimum)	25 Mbps (Minimum)
iv.	Frequency Range of Band (Unlicensed)	2400-2483.5 MHz or 5.8 GHz band	2400-2483.5 MHz or 5.8 GHz band
v.	PTZ Latency	150 msec	150 msec
vi.	Carrier to Interference ratio (C/I)	~3dB @ 10 Mbps, ~10dB @ 20 Mbps at --65dBm	~3dB @ 10 Mbps, ~10dB @ 20 Mbps at -65dBm
vii.	Nominal Receiver Sensitivity (dbm typical)	-	--86 dBm@ 10 Mbps, -79dBm @ 20 Mbps
viii.	Antenna Gain	13 dBi or higher	13 dBi or higher
ix.	Antenna Beam Width	3 dB antenna beam width 60^0, $90^0/120^0$ Azimuth and Elevation	3 dB antenna beam width 60^0, $90^0/120^0$ Azimuth and Elevation
x.	Equivalent	Adjustable from 10mW	-

	Isotropic Radiated Power	to 2.0 W	
xi.	Temperature	-10^0 C to + 50^0 C	-10^0 C to + 50^0 C
xii.	Access Method	Time Division Duplexing/ Time Division Multiple Access (TDD/TDMA)/ DSSS/OFDM Modulation	Time Division Duplexing/ Time Division Multiple Access (TDD/TDMA)/ DSSS/OFDM Modulation
xiii.	Interface	10/100 Base T, half/full duplex. Rate auto negotiated (802.3 compliant)/ BNC Input for Analog cameras.	10/100 Base T, half/full duplex. Rate auto negotiated (802.3 compliant)/ BNC Output for Monitors.
xiv.	Protocols to be Used	IPV4, UDP, TCP, ICMP, Telnet, HTTP, FTP, SNMP, MAC	IPV4, UDP, TCP, ICMP, Telnet, HTTP, FTP, SNMP, MAC
xv.	Network Management	HTTP, TELNET, FTP, SNMP Version 2c	HTTP, TELNET, FTP, SNMP Version 2c

5.6 High Resolution Large Video Display Unit:

5.6.1 This display unit shall be used for displaying multiple cameras in conjunction with viewing workstation.

5.6.2 One such display unit should display minimum 16 cameras on a single unit. Selection of these cameras shall be as per software specifications.

5.6.3 Video display unit shall be LCD/ Plasma type. LCD/ Plasma unit should have the following minimum features:

i.	Screen Size	102cm (40”) when measured diagonally on screen or as specified by purchaser.
ii.	Resolution	Full HD 1920 x 1080
iii.	Dynamic Contrast Ratio	15,000:1
iv.	Viewing angle (H/V)	170^0 / 170^0
v.	Response Time	6ms
vi.	Video I/P	S-Video, Video/Composite video, PC Analog input (RGB, D-sub)
vii.	Sound Output(RMS)	10W x 2
viii.	Display Control	Monitor control on screen display, programmable with remote

ix	Make	Sony, Samsung, Panasonic, Philips, LG or as specified by purchaser

5.7 Colour LCD Monitor:

5.7.1 Colour LCD monitor shall be high performance, high resolution colour display monitor with 20” viewable picture area and multi-standard compatibility.

5.7.2 It should deliver outstanding picture clarity with SVGA resolution. These monitors are to be used with PC workstations and servers.

5.7.3 Colour LCD monitor shall have following minimum specifications:

i.	Viewable Display Area: 20” when measured diagonally.
ii.	Horizontal Resolution: 500 TV Lines
iii.	Luminance Level: 500 Cd / sq. m
iv.	Contrast Ratio 1000:1
v.	Video Inputs: VGA ,SVGA
vi.	Monitor Control on Screen display, programmable with front panel
vii.	Rated life 50,000 hours, at 50% brightness or better
viii.	Viewing Angle: +/- 80 degrees (vertical), +/- 80 degrees (horizontal)
ix.	Approvals: UL or EN & FCC

5.8 Digital Keyboard:

5.8.1 The digital keyboard should be fully functional, multipurpose keyboard used for system control and programming.

5.8.2 Keyboard should include an integral variable speed pan/tilt/ zoom joystick and shall be able to select any camera and display it on any monitor.

5.8.3 Keyboard should control multiple P/T/Z cameras at the same time.

5.8.4 Keyboard should be with user-friendly menu displayed on LCD with dynamic menu and easy to read display.

5.8.5 Joystick (keyboard) should support RS 232/ RS 485 connectivity and RJ 11 connections and should be supplied with required interface units.

5.8.6 Keyboard shall automatically number monitors, cameras, sequences and guard tours. Users shall view video on monitors in the same way as controlling a matrix.

5.9 PC Workstation for Viewing, Monitoring and System Management:

5.9.1 The PC workstation for viewing, monitoring and management shall be able to provide high graphics display with DVD-Drive, USB/ PS/2 mouse and keyboard.

5.9.2 There should be one workstation for system management & general monitoring. Separate work stations shall be provided for viewing cameras in multi-screen mode on large video screen LCD units.

5.9.3 PC Workstation shall also consist of following minimum items:

(a). HDD Interface SAS/SATA/IDE or better, RAM 4 GB upgradable upto 24 GB, OS – Windows XP Professional/ Linux or latest.

(b). 256MB Dual DVI Graphic Card: NVIDIA NVS 295 or better.

(c). Workstation should have minimum 600 W power supply, 5 PCI slots (preferably 1 PCI express Gen 2x16 slot, 1 PCI Express Gen 1 x4 – with x8 connector, 1 PCI express Gen 2 x4 with x8 connector, 2 legacy PCI 32 bit / 33 MHz).

5.9.4 The workstation shall be Quad-core processors or higher with 2 GHz. It should be DELL or IBM or HP or Fujitsu or SUN make or as specified by purchaser.

5.9.5 The workstation shall have the minimum following specifications:

i.	Processor	Intel Quad Core Xeon W5580 CPU Processors, 3.2 GHz, 8 MB L3 Cache, 4 GB ECC DDR3 SDRAM scalable upto 24GB, OS – Windows XP Professional/ Linux or latest.
ii.	DVD R/W Drive	Required
iii.	Ethernet Card	10/100/1000 Base T.
iv.	Chipset	Intel® X58 chipset
v.	HDD	SAS 15K RPM 450GB, controller supporting SAS drives with host based RAID 0 or 1.

5.10 Server Hardware for Network Video Management and Recording:

5.10.1 Server for network video management & recording shall be 19" rack mountable, dual Intel quad core Xeon 5520 or better processor, 2.26 GHz or better chipset, Intel High Performance 5520 Chipset Intel Quick Path Interconnect (QPI) @ maximum 5.86GT/s or better. It should be DELL or IBM or HP or Fujitsu or SUN make or as specified by purchaser.

5.10.2 Server hardware for network video management & recording shall have the minimum following specifications:

i.	HDD Interface	6 x 2.5" Hot plug SAS or better, Memory 6 GB ECC DDR3 SDRAM expandable upto 144 GB, OS Microsoft Windows Server 2003 Standard Edition or higher with 5 Client licenses or Linux.
ii.	CD Drive	DVD ROM Drive
iii.	Ethernet Card	Quad Onboard/ on slot Gigabit Ethernet with Load Balancing and Fail over Support. Remote management card with IPv6 compliance.
iv.	Other Features	Onboard SAS Controller and SAS RAID controller for external connectivity with minimum 512 MB cache Hot-plug HDD, redundant Hot-plug power supply. 2 internal Hot-plug SCSI HDD. 1 or 2 U mounting.
v.	HDD	146 GB x 2 RAID 1 SAS HDD, 10,000 RPM

5.10.3 Suitable database licenses should be provided as required by the solution offered by the vendor.

5.11 External Storage Device with RAID 5 Protection:

5.11.1 A separate protected storage device shall be provided for recording the information at a location/ station.

5.11.2 The storage system should have atleast 4 interfaces of FC or iSCSI across dual redundant controllers, 4 GB protected Cache (battery backed or equivalent), scalability upto minimum 120 TB raw, redundant power supplies & fans. FC HBA card should to be provided in host server for connectivity in case system is provided with FC interface.

5.11.3 The storage device should support simultaneous play back and recording at full duplex operation. It should possess the capability of carrying SAS and SATA and should be accessible to the connected server. It should be DELL or IBM or EMC2 or Fujitsu or Hitachi or HP or SUN make or as specified by purchaser.

5.11.4 The system should provide minimum 18.0 TB usable after RAID 5 configuration for every 32 cameras for storing minimum 30 days recording or as specified by purchaser.

5.11.5 LED/LCD indicators shall be available for system status, power supply, fan fault, hard drives and carrier, enclosure management module.

5.11.6 RAID Configurations:

i. RAID levels 5
ii. Maximum 256 virtual drives
iii It should provide at least one hot spare disk

5.12 Layer 2 Switches for Field:

5.12.1 8 port layer 2 switches (or as specified by purchaser) as per RDSO specification No. RDSO/SPN/TC/63/2008 (with latest amendments/revision) are to be provided for field applications. These switches should have one 10/100/1000 SFP port (fibre port) and 7 fast ethernet ports. Switches should be either CISCO or Nortel or Extreme or Juniper or 3 Com or HP make or as specified by purchaser.

5.12.2 Switches should be PoE compliant as per IEEE802.3af.

5.12.3 Switch should be installed in proper IP 66 vandal proof housing with cooling fans in protected area in field i.e. at platform, concourse, foot over bridges & other locations as specified by purchaser.

5.12.4 Ethernet output from the IP camera shall be connected to the nearest switch through CAT 6 STP cable and the switch shall be connected to the central switch on optical fiber cable.

5.12.5 Required numbers of Small Form-factor Pluggable (SFP) modules, compact optical transceivers used in optical communications, should be supplied along with each switch. SFP modules should comply with Multi-Source Agreement (MSA), enabling the compatibility with other vendors' equipments.

5.13 Layer 3 Switch for the Control Room:

5.13.1 24 port layer 3 switch (or as specified by purchaser) as per RDSO specification No. RDSO/SPN/TC/63/2008 (with latest amendments/revision) shall be provided at control room. Switch should be either CISCO or Nortel or Extreme or Juniper or 3 Com or HP make or as specified by purchaser.

5.13.2 This switch shall take optic fibre input from all the field switches/ encoders installed in the field and shall give ethernet port connectivity to servers, work stations etc.

5.13.3 Switch should have 1000 baseX SFP ports (fibre ports) depending upon nos. of field switches/encoders to be connected on optic fibre cable and additional two SFP ports as spare. Remaining ports shall be fast ethernet ports. It should support advance routing protocols like OSPFv3 and BPG4 plus.

5.13.4 Required numbers of Small Form-factor Pluggable (SFP) modules, compact optical transceivers used in optical communications, should be supplied along with each switch. SFP modules should comply with Multi-Source Agreement (MSA), enabling the compatibility with other vendors' equipments.

5.14 Uninterrupted Power Supply System:

5.14.1 At least 5 KVA Uninterrupted Power Supply System of APC or TATA Libert make or as specified by purchaser shall be provided for complete surveillance system upto 32 cameras for reliable and interruption free surveillance. Actual capacity of UPS is to be decided by purchaser depending upon number of cameras, central control equipments and time duration of back up.

5.14.2 It should provide at least back up of ONE hour at full load or as specified by purchaser.

5.15 Cables:

	Connectivity	**Cable Type**
5.15.1	IP Cameras to Field Switch	CAT 6 STP Cable (up to distance of 90 meters) or single mode fiber with required media converters.
5.15.2	Analog Camera to Video Encoder	RG 11 Cable (up to distance of 350 meters), (for existing analog camera)
5.15.3	Video Encoder to Field Switch/ Central Switch	CAT 6 STP Cable (up to distance of 90 meters); 6 core optic fiber cable, SMF, 9/125, 1000 Mbps (from 90 meter up to distance of 2.5 Km)
5.15.4	Data Cable (Camera to Encoder) for PTZ Camera	Two core 16/0.2 mm twin twisted copper conductor PVC insulated screened data cable (for existing analog camera)
5.15.5	Field Switch to Central Switch	CAT 6 STP Cable (up to distance of 90 meters); 6 core optic fiber cable, SMF, 9/125, 1000 Mbps (from 90 meter up to distance of 2.5 Km)
5.15.6	Copper conductor Power Cable	3 Core * 2.5 sq mm copper conductor power cable for power supply

5.15.7	Central Switch to each central control equipment (Server, Workstation, Storage Device etc.)	CAT 6 STP cable (up to distance of 90 meters)

5.15.8 All cables used for wiring various components of video surveillance system shall conform to IS/IEC/BIS or better standards. They should also ensure high bandwidth, low attenuation and low losses in signal quality.

5.15.9 STP CAT-6 Cable:

5.15.9.1 STP (Shielded Twisted Pair) CAT-6 cable should be of 4 pair of 23 AWG solid bare copper (diameter 0.226 mm) with polyethylene Insulation and PVC Jacket and should comply following minimum specifications.

i.	Applicable Standard	:	TIA/EIA and ISO Category 6/Class E requirements. Performance – ETL Verified to TIA/EIA-568-B.2-1.
ii.	Characteristics Impedance	:	100M Ohms
iii.	Capacitance	:	5.6 nf/Km (nominal)
iv.	Voltage	:	300 VAC or DC
v.	Prorogation delay	:	536 ns/100m @ 250Mhz
vi.	Velocity of Prorogation	:	69%
vii.	Bend Radius	:	Approximately 1”

5.15.10 Video Cable:

5.15.10.1 RG 11 video cable of following minimum specifications shall be used for connecting existing analog cameras installed at various locations to encoder.

i.	Center conductor size	:	Solid Bare Copper 1.63 mm
ii.	Di-electric material	:	Polyethylene (PE), 7.1 mm dia White color.
iii.	Shield material	:	Copper
iv.	Di-electric outer diameter	:	15 mm
v.	Jacket material	:	PVC BLUE
vi.	Armour	:	1.1 mm GI wire round
vii.	Armour coverage	:	90 %
viii.	DC Resistance Inner conductor	:	8.5 Ohms/Km
ix.	Capacitance	:	53 +/- 3 nf/Km (nominal)
x.	Di-electric strength	:	10 KVA AC mains.

xi.	Maximum operating voltage at 50 Hz	:	5 KV
xii.	Insulation resistance	:	50 M ohm/ Km.
xiii.	Nominal impedance	:	75 ohms
xiv.	Min bending radius	:	55 mm
xv.	Approval/ Standards	:	EN 50117

5.15.11 Twisted Pair Cable with Shielding:

5.15.11.1 Twisted pair cable with shielding for controlling cameras and data communication shall be of following minimum specification.

i.	No of pairs	:	Two
ii.	Conductor size	:	1.5 sq. mm.
iii.	Primary insulation	:	Low density polyethylene (LDPE)
iv.	Thickness of insulation	:	0.5 mm
v.	Color	:	White and Black
vi.	Pair Twisting	:	10 to 15 twists per meter
vii.	Minimum shied thickness	:	0.05 mm
viii.	Drain wire	:	0.5 sq mm multistrand bare tinned annealed copper conductor.
ix.	Inner jacket color	:	Black Thickness >0.3 mm
x.	Outer jacket color	:	Black Thickness > 1.8 mm
xi.	Thickness of jacket	:	As per IS 1554 part-I
xii.	Armour over inner jacket	:	Galvanized Steel wire/ flat as per IS 1554 part I
xiii.	Approval/Standards	:	BS 5308

5.15.12 Power Cable:

5.15.12.1 Power cables used for extending power supply to various cameras and other devices shall have following minimum specifications.

i.	No of cores	:	3 (three)
ii.	Conductor size	:	2.5 sq mm, multi strand with standard annealed electrolytic copper conductor.
iii.	Primary insulation	:	PVC insulated
iv.	Thickness of PVC insulation	:	0.8 mm
v.	Color code	:	Red, Black and Green
vii.	Thickness of PVC inner Sheath	:	0.3 mm

viii.	Thickness of PVC outer Sheath	:	1.8 mm
ix.	Inner and outer sheath	:	PVC Black
x.	Armouring	:	Galvanized Steel Wire
xi.	Armour coverage	:	90 %
xii.	Conductor Resistance	:	8.2 ohms/Km
Xii	Approval/Standards		IS 694:1990 reaffirmed 1995 or latest

5.15.13 Optic Fiber Cable:

5.15.13.1 Optic fiber cable should be armoured consisting of atleast 6 monomode fibers of nominal diameter 8.8 micro meter to 9.8 micro meter and nominal cladding diameter 125 micro meter ± 1 or as specified by purchaser.

5.15.13.2 Armoured optic fiber cables are to be laid from encoders/ switches installed in the fields to core switch at central location.

5.15.13.3 Optic fiber cable shall meet the technical parameters defined in RDSO specification No. IRS: TC 55:2006 (Revision 1.0) with latest amendments if any.

5.16 Accessories for Terminating Optic Fiber Cables:

5.16.1 Fiber Optic Interconnect Unit (FOIU):

5.16.1.1 Fiber Optic Interconnect Unit should be provided for terminating the optic fiber cables. It shall provide minimum bending radius and the splice trays shall function as a splice cover for pigtail splicing. It shall be made of aluminum with powder coating in compliance with latest industry standard. Cable glands shall be provided for secured anchoring of incoming cables. Rubber grommets shall be provided at the cable entry point for tight sealing. The splice tray shall be made of ABS materials. FOIU should be of standard make.

5.16.2 Optic Fiber Connectors:

5.16.2.1 Optic fiber connectors should be single mode SC/ST type with push-pull mechanism and fully in compliance with latest industry standard. Optic fiber connectors should be of standard make.

5.16.3 Optic Fiber Adaptors:

5.16.3.1 Optic fiber adaptors should be suitable for single mode SC/ST type fiber cable connectors and shall be fully in compliance with latest industry

standard. It shall be with snap/latch mechanism. Optic fiber adapters should be of standard make.

5.16.4 Optic Fiber Patch Cords:

5.16.4.1 Optic fiber patch cords should be suitable for single mode SC/ST type fiber cable connectors with plastic moulded plug type connectors in compliance with latest industry standard. Optic fiber patch cords should be of standard make.

5.17 Copper to Fiber Media Convertor:

5.17.1 Media converter should be used to convert Ethernet port to fiber port and vice-versa. It should be of standard make.

5.17.2 Media converter should support half and full-duplex operation.

5.17.3 It should be transparent to IEEE 802.1Q packets.

5.17.4 Media converter should be PoE compliant as per IEEE 802.3af.

5.17.5 It should have option for rack-mounting.

5.17.6 It should have auto MDI/MDI-X feature which should enable the fiber optic ports on the media converter to pass the 'Link' status of their connections to each other. When the media converter detects a problem with one of the ports, such as the loss of connection to an end-node, the media converter should shut down the connection to the other port, thus notifying the node that the connection has been lost.

5.17.7 It should be possible to perform link test to determine which port is experiencing a problem in case of network problem for troubleshooting. The link test should be a fast and easy way to test the connections between the media converter ports and the end-nodes that are connected to the ports.

5.17.8 Front panel status indications shall be provided to indicate power, valid receive link, valid receive data, normal operation, fiber test mode etc.

5.17.9 Packet Transmission Characteristics:

(a). Round Trip Delay: 0.4μs Maximum

(b). Bit Error Rate (BER): $<10^{-12}$

(c).

Port Type (Connector)	Cable Distance	Optical Frequency	Launch Power (dBm)		Receive Power (dBm)	
			Max.	Min.	Min. Sensitivity	Typical Sensitivity
100FX MF	2km	1310nm	-14.0	-19.0	-31.8	-34.5
100FX SMF	15km	1310nm	-8.0	-15.0	-31.0	-31.0

5.17.10 Twisted Pair Interface:

	Min.	Typical	Max.
STP differential Output voltage	950mv	980mv	1050mv
Overshoot voltage		4%	5%
Single amplitude Symmetry	0.98	1.0062	1.02
Rise and fall time			
Rise	3.0ns	4.6ns	5.0ns
Fall	3.0ns	4.2ns	5.0ns
Rise and fall time Symmetry	0.4ns	0.5ns	

5.17.11 It should work on external power supply of 100-240V AC, 50/60Hz +/- 3%, input supply voltage 12V DC +/- 5%, maximum current 500mA and maximum power consumption 6W.

5.17.12 It should have satisfactory operation within temperature range of 0°C to 50°C.

6.0 SOFTWARE REQUIREMENTS:

6.1 Network Video Management Software:

6.1.1 This shall be a highly scalable enterprise level software solution. It shall offer a complete video surveillance solution that will be scalable to required numbers of cameras that can be added on a unit-by-unit basis.

6.1.2 The network video management software shall be licensed and shall operate on open architecture and should require no proprietary hardware. It should allow for seamless integration of third party security infrastructure where ever possible.

6.1.3 The network video management software should allow for video to be streamed on a video mosaic wall.

6.1.4 The user with administrative rights shall create clients (users) and give access to the software client application based on predefined user access rights.

6.1.5 The system shall allow the recording, live monitoring, playback of archived video and data simultaneously.

6.1.6 The software shall provide the following:

6.1.6.1 Several simultaneous live picture connections of camera in network.

6.1.6.2 Configuration of monitoring situation (site maps and workspace).

6.1.6.3 Programming of alarm-triggered automatic events in various alarms configuration.

6.1.6.4 System set up with limited operation options for clearly defined surveillance tasks.

6.1.6.5 Programming of automatic recording events on a network recorder.

6.1.7 The software shall display dual H.264 video streams in real time simultaneously at frame rates ranging from 1 fps to 25 fps and resolution ranging from 1 CIF to 4CIF.

6.1.8 Each camera's bit rate, frame rate and resolution shall be set independently from other cameras in the system, and altering these settings shall not affect the recording and display settings of other cameras.

6.1.9 The software shall provide automatic search and registration of components of video surveillance system on the network which can be cameras, monitors, alarm panels etc.

6.1.10 The software shall provide drag & drop functions on the system and also for set up of connection between cameras and monitors.

6.1.11 The software shall allow:

6.1.11.1 Live display of cameras.

6.1.11.2 Live display of camera sequences.

6.1.11.3 Control of PTZ cameras.

6.1.11.4 Playback of archived video.

6.1.11.5 Retrieval of archived video.

6.1.11.6 Instant Replay of live video.

6.1.11.7 Use of site maps.

6.1.11.8 Use of Macros

6.1.11.9 Configuration of system settings.

6.1.11.10 Configuration and programming of P/T/Z cameras, features like camera addressing, BLC, auto tours, presets etc.

6.1.12 The software should be able to do video recording on any of the following options - inbuilt hard disks on the server, direct attached storage boxes attached to servers, network attached storage, storage area network.

6.1.13 The software should be capable of handling camera and alarm icons on area maps. The area map should be configurable to pop up upon the receipt of an alarm received from a camera on the map. This can be on the same or other monitors on the PC.

6.1.14 The software shall be able to select the required recording based on the time recording was activated, the duration of recording, operator activated recording, event activated recording, scheduled recording.

6.1.15 The software shall offer a plug and play type hardware discovery service with the function of automatically discover devices as they are attached to the network.

6.1.16 The software shall provide a reporting utility for tracking for the following minimum options. Video and images shall be stored with reports for documenting events.

6.1.16.1 Alarms

6.1.16.2 Incidents

6.1.16.3 Operator logs

6.1.17 The software shall have the facility to export the desired portion of clipping of video from a desired date/time to another desired date/time on DVD/ on any client/ network storage device. Viewing of this recording shall be possible on authorized player which shall be provided by software manufacturer or in media player on computer utilizing a Window environment.

6.1.18 The software database servers shall not limit the number of network video recording servers which can be networked together to form video management and recording system.

6.1.19 The software database server shall maintain a catalog of settings for all the clients, servers, and IP cameras & IP enabled cameras in the system. If database management & recording can not be managed by single server, in such cases, additional server should be provided.

6.1.20 The software shall enable the client to dynamically create connections between cameras and clients and view live or recorded video on the digital VGA monitors (video, serial ports and digital I/Os).

6.1.21 The software shall provide the client seamless operation of all cameras and clients available in the system regardless of the actual connection to different Network Video Recording servers.

6.1.22 The software shall detect signal loss, low signal to noise ratio etc. and have the capability to alert the systems administrator.

6.1.23 The software shall receive all incoming events (motion detection and triggered digital input and relay output) in the system and take appropriate actions based on user-defined event/action relationships.

6.1.24 The software shall create an audit trail of all events and user activities.

6.1.25 The software shall support a built-in Virtual Video Matrix Switcher.

6.1.25.1 The Virtual Matrix Switch shall provide a full matrix operation of IP video to analog output.

6.1.25.2 The Virtual Matrix Switch shall provide a full matrix operation of IP video to digital monitors.

6.1.25.3 The Virtual Matrix Switch shall have the capability of creating camera sequences with the following functionalities:

6.1.25. 3.1 Each Sequence shall have capability up to hundreds of cameras.

6.1.25.3.2 Each camera in the sequence shall have its own individual dwell time, from 1 to 60 seconds.

6.1.25.3.3 Each entry in a sequence shall have the capacity to trigger PTZ camera presets, patterns or auxiliaries.

6.1.25.3.4 Multiple users shall be able to view the same camera sequence simultaneously, not necessarily synchronized one with the other.

6.1.26 The software shall provide alarm management module.

6.1.26.1 The alarm management shall be able to set any monitor or groups of monitors to automatically display cameras in response to alarm inputs.

6.1.26.2 The alarm management shall be able to reset automatically or manually alarmed video.

6.1.27 The software shall support absolute redundancy with X to N, N to X and N to N redundancy configurations. This feature should be provided, if specified by purchaser.

6.1.28 It shall be possible to search for recordings in the software by camera, date and time. If a data and time is specified, playback shall commence from that date and time. It shall be possible to playback more than one camera simultaneously.

6.1.29 The software should support at least 64 video streams concurrently. It should support atleast 4 monitors in one server/ workstation for displaying live video. It should allow minimum 5 levels of user and alarm prioritization. It should allow minimum 16 cameras to be replayed simultaneously.

6.2 Network Video Recording Software:

6.2.1 Software shall support recording of H.264 video streams. It shall support recording of video and audio for all the channels.

6.2.2 Software shall support triplex applications, recording, re-play and backup simultaneously. It shall be compatible with windows Server OS or Linux for highest performance and reliability.

6.2.3 Software shall operate on open architecture and should not require any proprietary hardware.

6.2.4 Software shall be able to record minimum 32 different video streams or more simultaneously. It shall be accessible from any PC connected to the network.

6.2.5 Software shall provide network time server function to ensure the synchronization of the video servers and the recordings.

6.2.6 The servers shall be connected to the network so that these can be placed at any location which has network access.

6.2.7 The software should be able to receive alarms of different types from equipment to start a recording. These alarms can be motion detection, video loss, and unified picture, trigger input.

6.2.8 The software alarm recording shall support pre-and post-alarm periods. Both can be configured in duration.

6.2.9 The software should provide a status of the available recording capacity, as well as an indication of the remaining possible recording time.

6.2.10 Fault Tolerant Recording:

6.2.10.1 If software & server(s) operation are interrupted, like power disconnection and once the server(s) are restarted, these shall automatically resume recording of any cameras these were recording prior to the interruption.

6.2.10.2 The software shall support network fault-tolerant recording such that if the network connection between a video management server and video recording server becomes unavailable, for example through cable breakage, network congestion or WLAN interruption, the system operation shall automatically recover when the connection is restored.

6.2.10.3 On the stations with more than 32 cameras and more than one recording server, system should be configurable with failover recording without any additional licensing.

6.2.11 Search & Export:

6.2.11.1 It shall be possible to search for recordings in the software by camera, date and time. If a data and time is specified, playback shall commence from that date and time. It shall be possible to playback more than one camera simultaneously.

6.2.11.2 The software shall be able to export sections of recordings to a separate Windows folder, which can then be written to CD-ROM, DVD-ROM or tape media to be played back at a location not connected to the network video management & recording network. The export process should make available a player application, which can be provided with the exported video. Export should be possible in Windows media player compatible format. Simultaneous export of multiple cameras should also be possible.

6.3 Video Analytics Software:

6.3.1 Possible applications of analytics software over the IP based video surveillance system, for specified number of cameras for specific stations, as defined by purchaser shall include the following minimum video analytics software.

a. Intrusion Detection
b. Left Object Detection
c. Overcrowding
d. Camera Tampering

6.3.2 Intrusion Detection:

6.3.2.1 The offered video analytic software shall include a comprehensive intrusion detection features. The intrusion detection shall be used for generating alarm under following scenarios:

a.) People crossing the tracks at platform ends.
b.) People entering railways operation areas.
c.) Object placed on the tracks through cameras placed at platform ends.
d). It should also generate directional alarms in defined areas like parking places, elevators etc.

6.3.2.2 The software shall have filters to distinguish between humans, animals or objects.

6.3.3 Left Object Detection:

6.3.3.1 The software feature shall include comprehensive left object detection.

6.3.3.2 The left object detection shall be able to detect:

a.) Object/ baggage left behind at platform/ waiting areas/ ticketing counters etc.
b.) The object detection shall also be used to detect vehicle parked in any location other than the parking areas.
c.) The alarm should be generated after a pre determined time decided by the purchaser.

6.3.4 Overcrowding:

6.3.4.1 The software for overcrowding shall be able to give a feedback to the administrator/ operator if the scene is over-crowded. It should give an alarm as soon as people converge at a single place above a predefined threshold level which should be adjustable as specified by purchaser.

6.3.5 Camera Tampering:

6.3.5.1 The software shall be able to detect sabotage or tampering to the cameras. It shall be able to detect camera blurring, camera blinding and change of orientation of fixed cameras.

6.3.5.2 Camera tampering feature shall be provided for all fixed cameras.

6.3.6 Video Analytics Software can be implemented either at firmware level at fixed IP cameras or at server level in the control room. This server shall be only

working for Video Analytics Software. Specification of this server shall be as per Clause No. 5.10.

6.3.7 Requirement of number of servers for running video analytic software shall be defined by the manufacturers.

6.3.8 Video analytics software should be provided on fixed IP cameras as per details mentioned in the table or as specified by the purchaser. Purchaser has to specify numbers of cameras to be provided with different types of video analytics software.

Type of Video Analytics Software	**Location of Cameras on which Video Analytics is to be provided**
Intrusion Detection	Cameras at Platform ends, Railway Control Room
Left Object Detection	Cameras on Platforms, ticketing areas & Concourse areas
Overcrowding	Cameras on Platforms, foot-over-bridges.
Camera Tampering	All Fixed Cameras

6.4 GUI (Graphic User Interface) Client Software Features:

6.4.1 The GUI software shall perform the following applications simultaneously without interfering with any of the storage server operations (recording, alarms, etc.):

6.4.1.1 Live display of cameras.

6.4.1.2 Live display of camera sequences.

6.4.1.3 Control of PTZ cameras.

6.4.1.4 Playback of archived video.

6.4.1.5 Retrieval of archived video.

6.4.1.6 Instant replay of live video.

6.4.1.7 Use of graphical controls (maps) and alarm management.

6.4.1.8 Use of procedures (Macros).

6.4.1.9 Configuration of system settings.

6.4.1.10 Execution of system macros.

6.4.2 The GUI software shall support any form of IP network connectivity, including: LAN, WAN, VPN, and wireless technologies.

6.4.3 The GUI software shall support multicast and unicast video streaming.

6.4.4 The GUI software shall provide an authentication mechanism, which verifies the validity of the user.

6.4.5 The GUI software shall allow for live monitoring of video.

6.4.6 It shall enable view of 1 to minimum 16 video tiles simultaneously on a single digital monitor at 25 fps per camera.

6.4.7 The software shall provide on each of the digital monitors independently the following tile views:

6.4.7.1 Full screen

6.4.7.2 Quad

6.4.7.3 3x3 (9-view)

6.4.7.4 4x4 (16-view) or better.

6.4.7.5 1+5 or 1+9 or 1+11 or 1+12 or 1+15 or better (one large and remaining small views)

6.4.8 The GUI software shall allow operators to view an instant replay of any camera.

6.4.8.1 The operator shall be able to define the amount of time he wishes to go back from a predefine list or through a custom setup period.

6.4.8.2 The operator shall be able to control the playback with play, pause, forward, and speed buttons.

6.4.9 The operator shall be able to choose and trigger following minimum action from a macro/site map:

6.4.9.1 View camera in a video tile.

6.4.9.2 View map or procedure in a video tile.

6.4.9.3 Starting/stopping PTZ pattern.

6.4.9.4 Go to PTZ preset.

6.4.10 The GUI software shall provide management and control over the system using a standard PC mouse, keyboard and CCTV keyboard.

6.4.11 The GUI software shall display all cameras attached to the system regardless of their physical location on the network.

6.4.12 The GUI software shall display all camera sequences created in the system.

6.4.13 The GUI software shall allow operators to control (pause/play, skip forwards, skip backwards) camera sequences, without affecting other operators' ability to view and control the same sequence.

6.4.14 The GUI software shall display all cameras, sequences and users in a logical tree.

6.4.15 The GUI software operator shall be able to drag and drop a camera from a tree of available cameras into any video tile for live viewing.

6.4.16 The GUI software operator shall be able to drag and drop a camera sequence from a tree of cameras into any video tile for live viewing.

6.4.17 The GUI software shall support graphical site representation (map) functionality, where digital maps are used to represent the physical location of cameras and other devices throughout facility.

6.4.18 The maps shall have the ability to contain hyperlinks to create a hierarchy of interlinked maps.

6.4.19 The operator shall be able to drag and drop a camera from a map into a video tile for live viewing in the same browser without opening a new browser.

6.4.20 The operator shall be able to click on an icon in a map to initiate PTZ camera preset, run PTZ pattern, view camera in an analog monitor or send an I/O stream.

6.4.21 The GUI software shall support digital zoom on a fixed camera's live video streams.

6.4.22 The GUI software shall support digital zoom on a PTZ camera's live video streams.

6.4.23 The operator shall be able to control pan-tilt-zoom, iris, focus, dome relays and dome patterns.

6.4.24 The software shall be able to display video of cameras on 40'' LCD/Plasma monitors or on any size of monitor as specified by purchaser.

6.4.25 The software shall allow the control of display from the client PC.

6.4.26 The operator from the GUI software shall be able to decide the screen layout and also the cameras that shall be displayed on the monitors.

6.4.27 The software shall support multicasting.

6.4.28 The software shall support display of full screen to minimum 4x4 layout of cameras. Other display patters to be supported should be 2 x 2, 3 x 3, 1+ 5, 1+ 7, 1+ 9, 1+12, 1+15 or better.

6.4.29 Its shall be possible to switch the screen layout in response to an alarm.

6.5 Licensing:

6.5.1 Vendor should offer required number of camera recording licenses along with video management license. Preferably, license should not restrict the number of recording servers used in the system. If licensing restricts the number of recording servers then at least 2 extra recording server licenses should be provided.

6.5.2 Preferably licensing should not restrict the storage size used in the system. If it does then storage licensing should be provided for at least 500% of current storage size.

6.5.3 Client licensing should not be restricted to specific physical workstations (PC) and should provide access from any workstation within the network with minimum 20 simultaneous users or as specified by purchaser.

6.5.4 Licensing of various types of video analytics software as mentioned in clause 6.3 depending upon numbers of cameras are to be specified.

6.5.5 Vendor should clearly specify licensing of various features.

7.0 TEST REQUIREMENTS:

7.1 Conditions of Tests:

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

7.1.2 Inspection and testing shall be carried out to the effect that all requirements of this specification are complied with.

7.1.3 Inspection shall be carried out for various types of cameras, lens, housing, mount, encoder, wireless transmitter/receiver unit, digital keyboard, PC work

station, server hardware, storage system, switches, video display units, colour LCD monitors, various type of cables including software.

7.2 Type Tests:

7.2.1 For type test, one complete system consisting of all type of cameras and other devices & equipments as mentioned in clause 4 & 5 along with software as mentioned in clause 6 shall be subjected to following tests as applicable:

a) Visual inspection (Clause 8.1)
b) Performance test (Clause 8.2)
c) Factory acceptance test (Clause 8.3)
d) Endurance test (Clause 8.4.1)

7.2.2 Following systems should be submitted to RDSO after approval.

a) Each type of camera with lens along with housing and mount suitable for both indoor and outdoor use.
b) Encoder
c) Digital Key Board

7.2.3 Only one complete system shall be tested for this purpose. The system shall successfully pass all the type tests for proving conformity with this specification. If any one of the equipment fails in any of the type tests, the purchaser or his nominee at his discretion, may call for another equipment/card(s) of the same type and subject it to all tests or the test(s) in which failure occurred. No failure shall be permitted in the repeat test(s).

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

7.3 Acceptance Tests:

7.3.1 The following shall constitute the acceptance tests which shall be carried out by the inspecting authority for the purpose of acceptance on randomly selected 10% of items offered from the lot (minimum 1 each type of item) offered for inspection by the supplier:

a) Visual inspection of complete system (Clause 8.1)
b) Performance test (Clause 8.2)
c) Endurance test (Clause 8.4.2)

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

7.4 Routine Tests:

7.4.1 The following shall comprise the routine tests and shall be conducted by manufacturer on every equipment and the test results should be submitted to the inspection authority before inspection. The application software in proper format shall also be submitted to the inspecting authority in advance.

a) Visual inspection of complete system (Clause 8.1)
b) Performance test (Clause 8.2)

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

8.0 TEST PROCEDURE:

The test procedure shall be based on the system design. The methodologies to be adopted for various tests shall be decided taking into account the system design/configuration.

8.1 Visual Inspection:

Each equipment of the system shall be visually inspected to ensure compliance with the requirement of clauses 2, 3, 4, 5 & 6 of this specification. The visual inspection shall broadly include:

8.1.1 System Level Checking:

- Constructional details.
- Dimensional check.
- General workmanship.
- Configuration.

8.2 Performance Test:

8.2.1 The following equipment shall comply with the requirements as specified in clauses 3, 4, 5 & 6.

(i). High Resolution Fixed Box Type IP Colour Camera as per Clause 5.1.
(ii) High Resolution Fixed Dome Type IP Colour Cameras as per Clause 5.2.
(iii). High Speed P/T/Z IP Colour Camera as per Clause 5.3.
(iv). Encoder as per Clause 5.4.
(v). Digital Keyboard as per Clause 5.8.

8.2.2 Following items shall be of specified make only complying all the parameters mentioned in the specification.

(i). Wireless Transmitter/Receiver Unit
(ii). High Resolution Large Video Display Unit
(iii). PC Workstation for viewing, monitoring and system management
(iv). Server Hardware for network video management, recording & video analytics
(v). External storage device with RAID 5 protection
(vi). Layer 2 & layer 3 switches for field and control room
(vii). Uninterrupted Power Supply System

8.3 Factory Acceptance Test:

8.3.1 Factory Acceptance Tests (FAT) results to verify compliances as mentioned in clauses 2, 3, 4, 5 & 6 for the following video surveillance equipments shall be submitted by the Original Equipment Manufacturer (OEM), if these items are being manufactured abroad, otherwise tests will be conducted in manufacturing premises of the firm.

(i). High Resolution Fixed Box Type IP Colour Camera as per Clause 5.1.
(ii) High Resolution Fixed Dome Type IP Colour Cameras as per Clause 5.2.
(iii). High Speed P/T/Z IP Colour Camera as per Clause 5.3.
(iv). Encoder as per Clause 5.4.
(v). Digital Keyboard as per Clause 5.8.

8.3.2 All software features as per clause no. 6 are to be tested in premises of vendor for which all required setups are to be arranged.

8.3.3 The FAT shall be able to prove compliance to the specifications through test or test certificates.

8.3.4 All compliances to various standards as given in specifications shall be submitted with documentary proof. These shall include certificates for EMI/EMC/safety/ environment protection.

8.3.5 Test results of various type of cables as per 5.15, accessories for terminating optic fiber cable as per clause 5.16 and copper to fiber media convertor as per clause 5.17 of the specification are to be submitted from the manufacturers of these items.

8.4 Endurance Test:

8.4.1 During type test, endurance test shall be conducted on complete system for continuous operation which shall be 168 hrs at ambient room temperature without giving any deterioration of video quality.

8.4.2 During acceptance test, endurance test shall be conducted on complete system for continuous operation which shall be 48 hrs at ambient room temperature without giving any deterioration of video quality.

9.0 QUALITY ASSURANCE:

9.1 All materials & workmanship shall be of good quality.

9.2 Since the quality of the equipment bears a direct relationship to the manufacturing process and the environment under which it is manufactured, the manufacturer shall ensure Quality Assurance Program of adequate standard.

9.3 Validation and system of monitoring of QA procedure shall form a part of type approval. The necessary Plant, Machinery and Test instruments as mentioned in Schedule of Technical Requirements (STR) shall be available with the manufacturer.

9.4 Along with the prototype sample for type test, the manufacturer shall submit the Quality Assurance Manual.

10.0 MARKING & PACKING:

10.1 The following information shall be clearly marked at a suitable place on each equipment:

a) Name and address of the manufacturer
b) Year of the manufacturer
c) Serial number of equipment
d) Schematic diagram of the equipment at suitable place

10.2 The equipment and its sub assemblies shall be packed in thermocole boxes and the empty spaces shall be filled with suitable filling material. Before keeping in the thermocole box, the equipment shall be wrapped with bubble sheet. The equipment shall be finally packed in a wooden case of sufficient strength so that it can withstand bumps and jerks encountered in a road/rail journey.

11.0 INFORMATION TO BE SUPPLIED BY THE PURCHASER:

11.1 The purchaser should clearly indicate details of required items for IP based Video Surveillance System which shall mainly consist of following items as per site requirement.

SN	DESCRIPTION	QTY	REMARKS
i.	Fixed box type IP colour Camera with lens, housing and mount as per Clause no. 5.1.	As specified by the purchaser	

ii.	Fixed dome type IP colour Camera as per Clause no. 5.2.	As specified by the purchaser	
iii.	Day/Night outdoor P/T/Z IP dome camera as per Clause no. 5.3.	As specified by the purchaser	
iv.	Encoder for existing analog cameras to convert in IP enabled cameras as per Clause no. 5.4.	As specified by the purchaser.	
v.	8 port Layer 2 field network switches for required number of cameras & SFP modules as per Clause no. 5.12.		The quantities of field network switches are to be finalized based on drawings of the railway premises according to location of cameras.
vi.	40" LCD/ Plasma monitor as per Clause no. 5.6 for viewing.	As specified by the purchaser.	One LCD monitor required for minimum 16 numbers of cameras.
vii.	20" LCD monitor as per Clause no. 5.7 for system management & monitoring.	As specified by the purchaser	Required nos. of LCD monitor are to be supplied depending upon nos. of PC workstations and servers.
viii.	Digital keyboard as per Clause no. 5.8.	As specified by the purchaser	
ix.	PC work station for viewing cameras as per Clause no. 5.9.	As specified by the purchaser	One workstation is required for two nos. of 40” monitors.
x.	Server Hardware for network video management as per Clause no. 5.10.	As specified by the purchaser	One server is required for network video management.
xi.	Server Hardware for network video recording as per Clause no. 5.10.	As specified by the purchaser	One video recording server is required for 32 numbers of

			cameras.
xii.	Server Hardware for video analytics as per Clause no. 5.10.	As specified by the purchaser	One server is required for video analytics of 32 numbers of cameras.
xiii.	External storage device of minimum 18 TB HDD for recording all the cameras for 30 days @ 2CIF configurable upto 4 CIF, 25 fps as per Clause no. 5.11.	As specified by the purchaser	One external storage device is required for 32 numbers of cameras.
xiv.	24 port Layer 3 Network Switch with required numbers of SFP modules, as per Clause no. 5.13.	As specified by the purchaser	
xv.	Network Video Management Software for required number of cameras as per Clause no. 6.1.	As specified by the purchaser	
xvi.	Network Video Recording Software for required number of cameras as per Clause no. 6.2	As specified by the purchaser	
xvii.	Video Analytics software as per Clause no. 6.3.	As specified by the purchaser	Numbers of cameras for various video analytic are to be specified.
xviii.	Graphical User Interface Client Software for required number of cameras as per Clause no. 6.4.	As specified by the purchaser	
xix.	Licensing for various features as per Clause no. 6.5.	As specified by the purchaser	
xx.	Armoured RG11 Video Cable as per clause no. 5.15. (Required for only IP enabled camera design.)	As specified by the purchaser.	The quantities of cables are to be quantified based on drawings of the railway premises according to location of cameras.
xxi.	Armoured twisted pair data cable as per clause no. 5.15. (Required for only IP enabled camera design.)		
xxii.	Armoured power cable as per clause no. 5.15.		
xxiii.	CAT 6 cable as per clause no. 5.15.		
xxiv.	Armoured 6 core single mode optic fiber cable as per clause no. 5.15.		
xxv.	Accessories for terminating optic fiber cables as per clause no. 5.16.	As specified by the purchaser.	

xxvi.	5 KVA UPS as per clause no. 5.14.	As specified by the purchaser.	One 5KVA UPS required for 32 numbers of cameras.
xxvii.	Junction boxes to house encoders/ field switches and termination of video, power & data cables and rack(s) for housing equipments in control room.		As per site requirement
xxviii.	Passive components for fiber terminations.		As per site requirement
xxix.	Copper to Fiber Media Convertor		As per site requirement
xxx.	Any other item(s) required for Video Surveillance System.		As per site requirement
xxxi.	Installation, testing & commissioning of the entire system.		

11.2 The purchaser should also mention the requirement for the storage capacity in Terra Bytes depending on the total number of all types of cameras at the station/premises. It is preferable to size the storage capacity for minimum 30 days of storage at 2CIF / 25 fps.

11.3 Purchaser shall provide detail drawings of railway premises indicating locations of different types of cameras. Vendor should access requirements of various components as stated in Clause 11.1 for video surveillance system which may vary from manufacturer to manufacturer as per their overall system design.

11.4 Vendor should provide suitable housing enclosures fitted with heater & blower kit to all outdoor equipments i.e. IP cameras, switches, encoders etc. to satisfactory work upto temperature of -10^{0}C, if required due to local weather conditions and specified by purchaser.

11.5 Any other item(s) required for completion of video surveillance system other than stated above, shall be arranged by vendor.

12.0 WARRANTY:

12.1 Manufacturer shall provide a three years warranty from date of supply of system which shall include repairing and replacing of defective parts of system, if any or as specified by purchaser.

12.2 Manufacturer shall support the system during its life time but at least for 7 years from its commissioning. Confirmation for this is to be submitted by manufacturer.

13.0 TRAINING:

13.1 On site training shall be provided to the Railway staff which shall include complete assembly of the system through the use of various modules, integration of hardware with software and complete operation of the system.

13.2 Sets of training manual in two hard copies and two soft copies containing details of technical specifications, installation and commissioning, trouble shooting & maintenance schedule etc. shall be supplied along with the equipment.

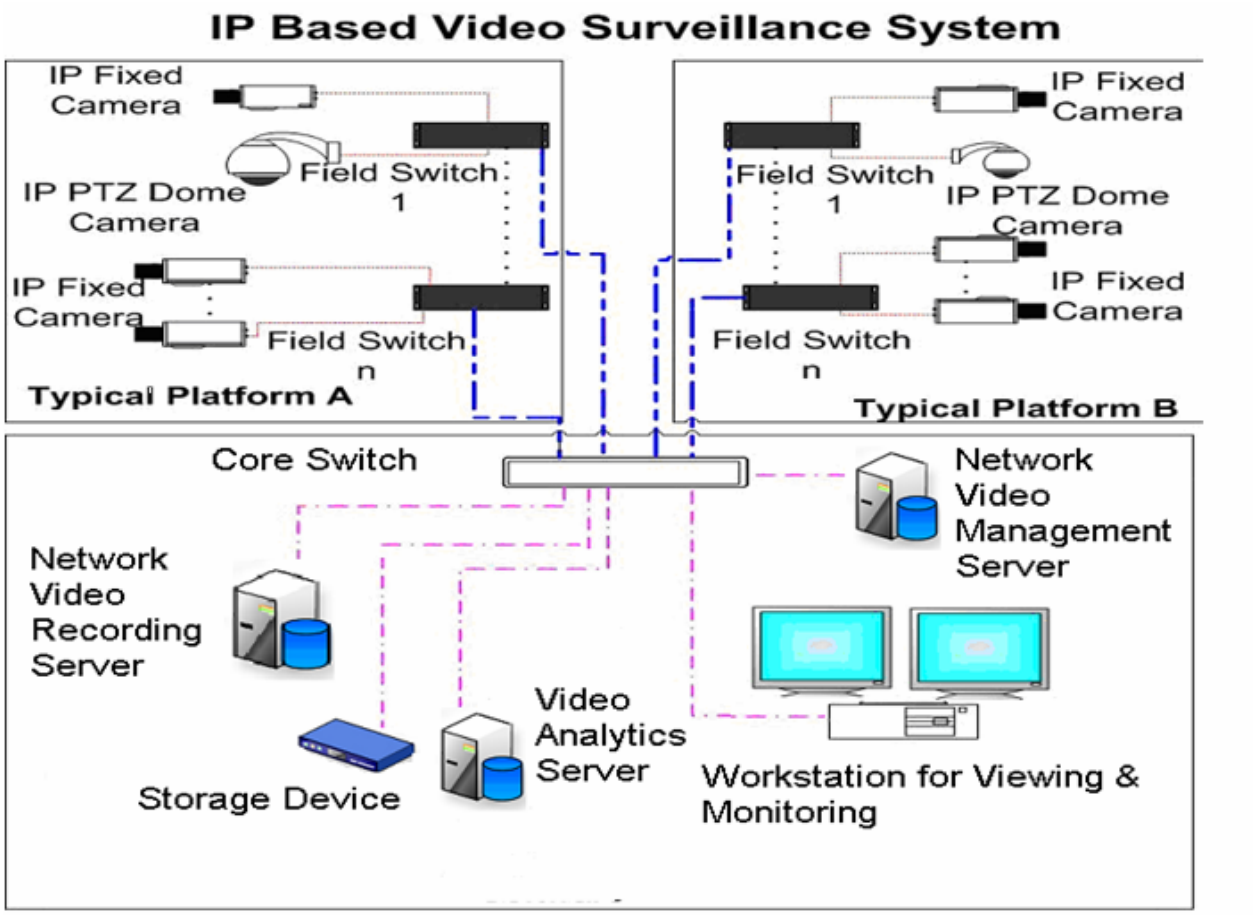
14.0 DOCUMENTATION:

14.1 The following documents should be supplied along with the system:

a) Mechanical drawings of each sub system/ rack.

b) Installation and maintenance manual incorporating trouble shooting exercises, printed cards patterns, software etc.

c) Operating and trouble shooting manual including maintenance schedule.

d). Pre-commissioning check list.

15.0 SCHEMATIC DIAGRAM –1 OF End to End IP VIDEO SURVEILLANCE SYSTEM