



# REQUEST FOR PROPOSAL

For

Selection of Master System Integrator (MSI)

to

Design, Develop, Implement and Maintain Integrated Command & Control Centre (ICCC) platform on Cloud-based DC & DR, establish local data centre, viewing centres and field infrastructure, network connectivity for 3 Smart Cities (Amritsar, Jalandhar, and Sultanpur Lodhi) of Punjab (2<sup>nd</sup> Call)

**Volume II (Part - E): Technical Specifications for Common Components**

RFP Number: PMIDC/GM(P)/SCM/ICCC/2021-22

September 07, 2021

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**Note: Below Specifications of items are indicative and are subject to change in case it pinpoints to a specific OEM if reported at the time of pre-bid meeting.**

## 1. Surveillance Components

### 1.1. High Definition PTZ Dome Camera- 4 MP

S. No.	Parameter/ requirement	Minimum Specifications/requirements	Compliance (Yes / No)
1.	<b>Image Sensor</b>	1/3.0" Progressive Scan CMOS or better	
2.	<b>Lens</b>	Auto-focus, 4.4–120mm (corresponding to 25x) or better	
3.	<b>Operating Frequency</b>	Min 50 Hz	
4.	<b>Day/ Night Operation</b>	Automatic with IR Cut Filter	
5.	<b>Minimum Illumination</b>	Colour: 0.05 Lux B/W": 0.01 Lux or better	
6.	<b>high-speed pan-tilt functionality</b>	360° endless pan range and a 180° tilt range	
7.	<b>Optical Zoom</b>	30x Minimum & 12x Digital Zoom, Total 360x Zoom or better	
8.	<b>Lens</b>	4.5-129 mm or better	
9.	<b>Image Resolution</b>	2592 x 1520 or better	
10.	<b>Compression</b>	H.265 Baseline, Main and High Profiles, Motion JPEG	
11.	<b>Frame Rate and Bit Rate</b>	25 FPS at all resolutions with Controllable Bit Rate/ Bandwidth and Frame Rate. In CBR Priority to be defined for Video quality or frame rate and the bandwidth upper limit shall not exceed the defined limit	
12.	<b>GOP/ GOV</b>	Ability to change the GOP/GOV / I-frame Length to optimize t the GOP/ GOV bandwidth and storage	
13.	<b>Video Streams</b>	Minimum 3 Streams @ 1920x1080, H265, 25 fps	
14.	<b>Motion Detection</b>	Yes, built in with multiple configurable areas in the video stream	
15.	<b>Electronic Shutter</b>	1/10000 s to 1 s or better	
16.	<b>Electronic Exposure &amp; Control</b>	Automatic/ Manual	
17.	<b>Wide Dynamic Range</b>	90 dB or Better	
18.	<b>Backlight Compensation</b>	Required	

S. No.	Parameter/ requirement	Minimum Specifications/requirements	Compliance (Yes / No)
19.	<b>Electronic Image Stabilization</b>	Required	
20.	<b>Privacy Masks</b>	Minimum 8 configurable 3D zones or better	
21.	<b>Pre-set Positions</b>	Minimum 256 or better	
22.	<b>Image Flip</b>	Yes Automatic	
23.	<b>Guard Tour</b>	Minimum 2 Nos	
24.	<b>Built In Heater &amp; FAN</b>	Required	
25.	<b>Temperature Control</b>	Required	
26.	<b>Alarm</b>	Min. 2 Alarm Input / Output ports or better	
27.	<b>On-screen directional indicator</b>	Required	
28.	<b>Compression</b>	The camera shall for its H.265 implementation support scene adaptive bitrate control, in order to lowering bandwidth and storage requirements. The camera shall support automatic dynamic GOP for optimal bitrate utilization. The camera shall support automatic dynamic ROI to reduce bitrate in un-prioritized regions.	
29.	<b>Event Triggers</b>	The camera shall be able to send and received trigger directly from any other camera without interface of VMS. Motion Detection, Audio Detection, Network, Temperature, Manual Trigger, Virtual Inputs, Alarm Inputs, PTZ: Error, Moving, Pre-set Reached, Ready, Storage Disruption, Storage Recording, System Ready, User schedule	
30.	<b>Event Actions</b>	File upload via FTP, SFTP, HTTP and email Notification via email, HTTP and TCP Pre- and post-alarm video buffering, External output activation, PTZ pre-set, guard tour, Video recording to edge storage, Day/ night mode, Overlay text	

S. No.	Parameter/requirement	Minimum Specifications/requirements	Compliance (Yes / No)
31.	<b>Edge Storage</b>	Built in SD card slot with support up to 128 GB with Class 10 speed	
32.	<b>Storage</b>	The Cameras shall have the feature to directly record the videos/ images onto NAS	
33.	<b>Protocols</b>	At least IP, HTTP, HTTPS, SSL/TLS, TCP, ICMP, SNMPv1/v2c/v3, RTSP, RTP, UDP, IGMP, RTCP, SMTP, FTP, DHCP, UPnP, ARP, DNS, DynDNS, NTP. IPv4 & IPv6	
34.	<b>Text Overlay</b>	Date & time, and a customer-specific text, camera name, graphical image etc.	
35.	<b>Security</b>	Password protection , HTTPS encryption, IEEE 802.1Xa network access control, Digest / user authentication, User access log	
36.	<b>Firmware Upgrade</b>	The firmware upgrade shall be done though web interface, The firmware shall be available free of cost	
37.	<b>Logs</b>	The camera shall provide Minimum 200 logs of latest connections, access attempts, users connected, changes in the cameras etc.	
38.	<b>Interface</b>	RJ 45, 100 Base TX	
39.	<b>Enclosure</b>	Die Cast Aluminium, IP66 rated	
40.	<b>Mount</b>	Wall / Pole Mount	
41.	<b>Power requirements</b>	PE IEEE 802.3af / POE + IEEE 802.3at compliant	
42.	<b>Operating Temperature</b>	-10 °C to 55 °C or better	
43.	<b>Operating Humidity</b>	20–85% RH or better	
44.	<b>Certification</b>	UL, CE, FCC	
45.	<b>Application Programmers Interface</b>	The interface shall be available for integration with 3rd party analytics	
46.	<b>Onvif</b>	S & G required	
47.	<b>Warranty</b>	Min 3 Years OEM warranty	
48.	<b>Defog</b>	Camera should support Optical Defogging & Image Stabilizing	

## 1.2. Facial Recognition Camera (8 MP)

S. No.	Parameter/requirement	Minimum Specifications/requirements	Compliance (Yes / No)
1.	Imaging device, imager type (Resolution)	1/ 2" or better, CMOS Progressive Scan & Minimum 8 MP or higher	
2.	Electronic Shutter Range	1 to 1 / 20,000 s or better	
3.	Focus mode	Automatic / Manual	
4.	Automatic Gain Control	Automatic / Manual	
5.	Lens	2.7 to 12 mm/3.7-16 mm Auto focus lens or better, Auto Iris / DC-Iris	
6.	Frame Rate	8 MP (3840*2160) Max. 20-25 fps or better	
7.	Compression	H.265, H.264, MJPEG or better	
8.	Minimum Illumination	0.02 Lux @f1.2/f1.5 AGC ON (Colour) & 0 Lux with IR ON or better	
9.	Backlight Compensation	Required, Camera should adjust BLC feature automatically depending on the light condition	
<b>Video</b>			
10.	Day and Night	Automatic, Color, Mono	
	Functionality		
11.	IR illuminator	Internal Illuminator with visibility should be at least 50 meters	
12.	Video Resolution	Mainstream: 8MP (3840*2160), 5MP (2592*1944)	
		Sub Stream: 2MP (1920 x 1080)	
		Third Stream: D1(720 x 576)	
13.	WDR	≥ 120dB	
14.	HLC, BLC	Should be available	
15.	Video Streams	H.265, H.264, MJPEG	
16.	Intelligent Video	As per features defined in RFP for video analytics	
<b>Network &amp; Interface</b>			
17.	Interface	RJ-45 for 10/100 base-T Ethernet	
18.	Network Protocols support	IPv4, IPv6, HTTP, HTTPS, TCP/ IP, RTSP, RTCP, RTP, ICMP, UDP, IGMP, DNS, DHCP, NTP, SNMP, PPPoE, 802.1X, DDNS, SMTP, UPnP, FTP, QoS	



S. No.	Parameter/ requirement	Minimum Specifications/requirements	Compliance (Yes / No)
19.	Alarm Event	Events / alerts send via FTP, SMTP, HTTP, Pre -Post alarm video buffering.	
20.	Compatible Integration	ONVIF profile S & G	
21.	Network Security	IP Address Filtering, Tampering Alarm, Access Policy, ARP Protection, RTSP Authentication, User Authentication	
22.	General Security	OEM of the camera should not be blacklisted in India or anywhere globally for security reasons.	
23.	Alarm Interface	1 Ch Input / 1 Ch Output	
24.	Audio Interface	1 Ch Input / 1 Ch Output	
25.	Audio Codec	G.711, Two-way audio	
26.	On board Storage	128 GB or Better	
<b>General Camera Features</b>			
27.	Operational Temperature °C	-20°C to 60 °C	
28.	Casing	IP 67 or better rated housing with bracket	
29.	Power	PoE IEEE 802.3af/ at class0, DC12V	
30.	Power Consumption	Max. 20 W	
31.	Certifications	UL, CE, FCC, BIS	

### 1.3. ANPR

S. No.	Parameter/ requirement	Minimum Specifications/requirements	Compliance (Yes / No)
1.	General Requirements	The camera should be commercial / industrial grade designed for 24 x 365 use.	
2.	Image Sensor with WDR	1/2.8" or better with WDR, progressive CMOS Sensor or better	
3.	Lens Specs	Compatible to image sensor, Full HD (1080P), P IRIS / DC IRIS / Auto IRIS, Corrected IR, C / CS Mount with IR cut filter	
4.	Focal length	5x varifocal lens (Lower limit as 10mm or less, and Upper limit as 50mm or greater) or better	
5.	Resolution	Active Pixels 1920 x 1080 (2 MP)	

S. No.	Parameter/ requirement	Minimum Specifications/requirements	Compliance (Yes / No)
6.	<b>Minimum illumination</b>	Colour: 0.3 lux or better, B/W: 0.05 lux or better (at 30 IRE)	
7.	<b>Video Compression</b>	H.265, Motion JPEG	
8.	<b>Frame Rate</b>	Minimum 60 FPS or higher for all resolutions	
9.	<b>Local Storage</b>	SD Card Slot with minimum 64 GB Class 10 SD card and expansion 128 GB	
10.	<b>Ethernet</b>	10/100/ Base-T ports	
11.	<b>Protocols</b>	Minimum of the following protocols to be supported RTSP, RTP/TCP, RTP/UDP, HTTP, HTTPS, DHCP, 802.11x	
12.	<b>Industry Standards</b>	ONVIF Compliant	
13.	<b>Power Supply</b>	POE IEE 802.3af/ at compliant	
14.	<b>Operating Temperature</b>	0° C to 50° C or better	
15.	<b>Operating Humidity</b>	20% to 90% for cameras	
16.	<b>Enclosure / Casing</b>	IP 66 with Cast iron or aluminium alloy casing	
17.	<b>Certifications</b>	UL, CE, FCC	
18.	<b>Streaming</b>	The camera shall be able to setup and stream out minimum three (3) stream profiles. Each stream profile shall have its own compression, resolution, frame rate and quality independently. All the 3 streams should be individually configurable and compatible with H.264 with smart codec / H.265.	
19.	<b>White Balance</b>	Auto / Manual	

S. No.	Parameter/ requirement	Minimum Specifications/requirements	Compliance (Yes / No)
20.	<b>Back Light Compensation</b>	Auto	
21.	<b>Security</b>	Security Password protection	
22.	<b>Security</b>	Vandal and impact resistant housing, IK 10, IP66 / NEMA	

#### 1.4. RLVD

S. No.	Parameter/ requirement	Minimum Specifications/requirements	Compliance (Yes / No)
1.	<b>General Requirements</b>	The camera should be commercial / industrial grade designed for 24 x 365 use.	
2.	<b>Image Sensor with WDR</b>	1/2.8" or better with minimum WDR, progressive CMOS Sensor or better	
3.	<b>Lens Specs</b>	Compatible to image sensor, Auto IRIS / P IRIS / DC IRIS, Corrected IR, C / CS Mount with IR cut filter	
4.	<b>Focal length</b>	3x varifocal lens (Lower limit as 4 mm or less, and Upper limit as 8mm or greater) or better	
5.	<b>Resolution</b>	Active Pixels 1920 x 1080 (2 MP)	
6.	<b>Minimum illumination</b>	Colour: 0.3 lux or better, B/W: 0.05 lux or better (at 30 IRE)	
7.	<b>Video Compression</b>	H.265	
8.	<b>Frame Rate</b>	Minimum 30 FPS or higher for all resolutions	
9.	<b>Local Storage</b>	SD Card Slot with minimum 64 GB Class 10 SD card and expansion 128 GB	
10.	<b>Ethernet</b>	10/100 Base-T ports	
11.	<b>Protocols</b>	Minimum of the following protocols to be supported RTSP, RTP/TCP, RTP/UDP, HTTP, HTTPS, DHCP, 802.11x	

S. No.	Parameter/ requirement	Minimum Specifications/requirements	Compliance (Yes / No)
12.	<b>Industry Standards</b>	ONVIF Compliant	
13.	<b>Power Supply</b>	POE IEE 802.3af/at compliant	
14.	<b>Operating Temperature</b>	0° C to 50° C or better	
15.	<b>Operating Humidity</b>	20% to 90% for cameras	
16.	<b>Enclosure / Casing</b>	IP 66 with Cast iron or aluminium alloy casing	
17.	<b>Certifications</b>	UL, CE, FCC	
18.	<b>Support</b>	The camera should not be end of life / end of service for minimum 7 years, and OEM should certify that they will give spare support	
19.	<b>Streaming</b>	The camera shall be able to setup and stream out minimum three (3) stream profiles. Each stream profile shall have its own compression, resolution, frame rate and quality independently. All the 3 streams with 30 FPS should be individually configurable and compatible with H.264 with smart codec / H.265.	
20.	<b>White Balance</b>	Auto / Manual	
21.	<b>Back Light Compensation</b>	Auto	
22.	<b>Security</b>	Security Password protection	
23.	<b>Security</b>	Vandal and impact resistant housing IP66 / NEMA	
24.	<b>Field of View</b>	3.5 meter for one lane or better	

## 1.5. Body Camera

S. No.	Parameter/ requirement	Minimum Specifications/requirements	Compliance (Yes / No)
1.	Resolution	20 MP or better	
2.	Weight	Upto 200 Grams or Lower	
3.	Lens	130° wide angle	
4.	Connection Interface	USB 2.0	
5.	Storage	64 Gb or Higher	
6.	Wi-Fi	Yes	
7.	Bluetooth	Yes	
8.	Microphone	Yes	
9.	Battery Life (Fully Charged)	08 Hours or more	
10.	Frame Rate	30 FPS	
11.	Operating Temperature	-10°C ~ 60°C	
12.	Storage Temperature	-10°C ~ 70°C	
13.	IP Rating	IP 67/IP 66	
14.	Viewing Angel	120° (diagonal) or above	
15.	IR	Built-in min. 10 meter	
16.	Required Accessories	USB cable/360° rotatable clip/Adapter/Velcro holder	
17.		Camera should support Digital Defogging	
18.	Certifications	UL/ CE/ EN	

## 1.6. Industrial grade Field Layer-2 FE/ GE 16 port POE Switch

S. No.	Parameter/ requirement	Minimum Specifications/requirements	Compliance (Yes / No)
1.	<b>Genera</b>	The switch should provide Minimum 16 port or 2 X 8 Ports of 10/ 100/ 1000 Mbps GE ports and 2/ 4 GE SFP uplinks Ports. Should be proposed with ruggedized transceivers as per solution. The switch shall be DC powered. Should support minimum 20 Gbps or more, full duplex wire rate switching throughput.	
2.	<b>Layer 2</b>	802. 1Q VLAN on all ports with support for minimum 256 active VLANs or higher	
3.	<b>PoE</b>	Switch should have minimum 150W PoE power available or extra power injector should be provided in the junction box	
4.	<b>Layer 2</b>	Spanning Tree Protocol as per IEEE 802.1d, 802.1s and 802.1w	
5.	<b>Layer 2</b>	Should support Improved resiliency with the support ITU-T standard for ring topology which should provide 50ms ring convergence	
6.	<b>General</b>	Switch should support non-blocking throughput and IPv4 & IPv6 routes	
7.	<b>L2</b>	Switch should support classification and scheduling as per IEEE 802.1P	
8.	<b>QoS</b>	Switch should support strict priority queuing or Policing or equivalent to guarantee that the highest-priority packets are serviced ahead of all other traffic.	
9.	<b>Certification</b>	RoHS Compliant, IEEE 802.3af, 802.3at, NTP	
10.	<b>Environmental</b>	Operating Temperature - 10C to +65C with fan less design	
11.	<b>Environmental</b>	Relative Humidity of 5% or 95% Non-condensing	
12.	<b>Certification</b>	Switch should be EN 61000-4-2 Electrostatic Discharge, EN 61000-4-5 Surge, EN 61000-4-8 Power Frequency Magnetic Field, EN61000-4-6 for Conducted susceptibility	
13.	<b>Certification</b>	Must support FCC 47 CFR Part 15 Class A/ FCC Part 15B, Class A	
14.	<b>Standard</b>	EN 55022	
15.	<b>Standard</b>	Protection Class -minimum IP 30, NEMA-TS2	
16.	<b>PoE</b>	The switch shall support per-Port PoE configuration	

## 1.7. Industrial grade Field Layer-2 FE/ GE 8 port POE Switch

S. No.	Parameter/requirement	Minimum Specifications/requirements	Compliance (Yes / No)
1.	<b>Genera</b>	The switch should provide Minimum 8 Ports of 10/100/ 1000 Mbps GE ports and 2 GE SFP uplinks Ports. Should be proposed with ruggedized transceivers as per solution. The switch shall be DC powered. Should support minimum 20 Gbps or more, full duplex wire rate switching throughput	
2.	<b>Layer 2</b>	802. 1Q VLAN on all ports with support for minimum 256 active VLANs or higher	
3.	<b>PoE</b>	Switch should have minimum 200 W PoE power available or extra power injector should be provided in the junction box	
4.	<b>Layer 2</b>	Spanning Tree Protocol as per IEEE 802.1d, 802.1s and 802.1w	
5.	<b>Layer 2</b>	Should support Improved resiliency with the support ITU-T standard for ring topology which should provide 50ms ring convergence	
6.	<b>General</b>	Switch should support non-blocking throughput and IPv4 & IPv6 routes	
7.	<b>L2</b>	Switch should support classification and scheduling as per IEEE 802.1P	
8.	<b>QoS</b>	Switch should support strict priority queuing or Policing or equivalent to guarantee that the highest-priority packets are serviced ahead of all other traffic.	
9.	<b>Certification</b>	RoHS Compliant, IEEE 802.3af, 802.3at, NTP	
10.	<b>Environmental</b>	Operating Temperature - 10C to +65C with fan less design	
11.	<b>Environmental</b>	Relative Humidity of 5% or 95% Non-condensing	
12.	<b>Certification</b>	Switch should be EN 61000-4-2 Electrostatic Discharge, EN 61000-4-5 Surge, EN 61000-4-8 Power Frequency Magnetic Field, EN61000-4-6 for Conducted susceptibility	
13.	<b>Certification</b>	Must support FCC 47 CFR Part 15 Class A/ FCC Part 15B, Class A	
14.	<b>Standard</b>	EN 55022	
15.	<b>Standard</b>	Protection Class -minimum IP 30, NEMA-TS2	
16.	<b>PoE</b>	The switch shall support per-Port PoE configuration	

## 2. City Datacentre Active Infra Equipment's

### 2.1. 12-Port Layer 3 10G Switch (For Interconnecting)

S. No.	Parameter/ requirement	Minimum Specifications/requirements	Compliance (Yes / No)
1.	General	Switch Should have 12 numbers of 10GSFP+ ports or higher populated with multi-mode modules	
2.	General	Should have Internal Redundant Power supply	
3.	General	Switch should be based on a Modular OS Architecture	
4.	General	Switch should have USB for OS Management (uploading, downloading & booting of OS and Configuration).	
5.	General	Switch should have Multicore CPU Architecture.	
6.	General	Should have at least 2GB of Flash for storing OS and other Logs and 2GB DRAM	
7.	General	Switch should have Front to Back Airflow system and 3 number of field replaceable FAN's. In case of failure of one fan then other fans should automatically speed-up	
8.	General	Switch should have power savings mechanism wherein it should reduce the power consumption on ports not being used.	
9.	General	Switch should be Rack Mountable and should not take space more than 1RU	
10.	Performance	Forwarding rate – 210 Mbps at least	
11.	Performance	Configurable at least 32000 MAC addresses	
12.	Performance	Should support at least 12K Ipv4 Routes	
13.	Stacking/virtual chassis	Switch should have dedicated stacking port/ uplink ports and should support at least 8 number of switches in a single stack	
14.	Stacking/virtual chassis	The Switch stack should be based on Distributed forwarding Architecture, where in each stack member forwards its own information on network.	
15.	Stacking/virtual chassis	The Switch stacking should support 320 Gbps of throughput.	
16.	Stacking/virtual chassis	The Switch stacking should support automatic upgrade when master switch receives a new software version.	
17.	Layer 3	The Switch should support routing protocols such OSPF, BGPv4, IS-ISv4	
18.	Layer 3	The Switch should support IP Multicast routing protocol i.e. PIM, PIM Sparse Mode/PIM Dense Mode/ PIM Sparse-dense Mode & Source-Specific Multicast/ IGMPv3	
19.	Layer 3	The Switch should have basic IP Unicast routing protocols (static, RIPv1/ RIPv2) and VRRP	
20.	Layer 3	The Switch should have IPv6& IPv4 Policy Based Routing (PBR) and Inter VLAN Routing	



S. No.	Parameter/ requirement	Minimum Specifications/requirements	Compliance (Yes / No)
21.	Layer 2	The Switch should be able to discover (on both IPv4 & IPv6 Network) the neighbouring device giving the details about the platform, IP Address, Link connected through etc. thus helping in troubleshooting connectivity problems.	
22.	Layer 2	The Switch should support centralized VLAN Management, VLANs created on the core switch should be propagated automatically.	
23.	Layer 2	The Switch should support 802.3ad (LACP) to combine multiple network links for increasing throughput and providing redundancy.	
24.	Network Security	The Switch should have Port security to secure the access to an access or trunk port based on MAC address to limit the number of learned MAC addresses to deny MAC address flooding.	
25.	Network Security	The Switch should support Dynamic ARP inspection (DAI) to ensure user integrity by preventing malicious users from exploiting the insecure nature of ARP.	
26.	Network Security	The Switch should support IP source guard to prevent a malicious user from spoofing or taking over another user's IP address by creating a binding table between the client's IP and MAC address, port, and VLAN.	
27.	Network Security	The Switch should support flexible & multiple authentication mechanism, including 802.1X, MAC authentication bypass /equivalent, and web authentication using a single, consistent configuration.	
28.	Network Security	The Switch should support Private VLANs to restrict traffic between hosts in a common segment by segregating traffic at Layer 2, turning a broadcast segment into a no broadcast multi-access like segment to provide security & isolation between switch ports, which helps ensure that users cannot snoop on other users' traffic.	
29.	Network Security	The Switch should support IPv6 RA Guard, DHCPv6 guard, IPv6 Snooping to prevent any Man-in-middle attack.	
30.	Operational	The Switch should support dynamic port and session configuration management.	
31.	Quality of Service	The Switch should support IP SLA or equivalent feature set to verify services guarantee based on business-critical IP Applications.	
32.	Operational	The Switch should support Auto QoS for certain device types and enable egress queue configurations.	
33.	Operational	The Switch should support Rate limiting based on source and destination IP address, source and destination MAC address, Layer 4 TCP/UDP information, or any combination of these fields, using	

S. No.	Parameter/ requirement	Minimum Specifications/requirements	Compliance (Yes / No)
		QoS ACLs (IP ACLs or MAC ACLs), class maps, and policy maps.	
34.	Application visibility	The Switch should support Sflows/ NetFlow/Jflow/ equivalent per switch	

## 2.2. Core Router

S. No.	Parameter/ requirement	Minimum Specifications/requirements	Compliance (Yes/No)
1.	Architecture	Router should have redundant controller cards (redundant Control / Data plane) and should support stateful switchover, non-stop forwarding, Non-stop routing and Graceful restart	
2.	Architecture	Router shall support sync any configurations from previous modules to new modules with hot-swap event occurred	
3.	Architecture	The router shall support Gigabit Ethernet interface	
4.	Architecture	All the Ports and card on Router should be hot swappable and field replacement of port or card should not bring down the chassis.	
5.	Performance	Router shall support minimum non-blocking capacity of 40 Gbps with scalability of up to 60Gbps without changing the hardware	
6.	Performance	Router shall support 60 Mpps forwarding performance for IPv4 & IPv6 performance.	
7.	Performance	Router shall support 16000 Mac addresses	
8.	Performance	Router shall support 18000 IPv4 routes	
9.	Performance	router shall support 4000 queues and 128 MPLS VPN's	
10.	Performance	Router shall support aggregation of links. Minimum 8 links should be supported as part of single aggregation	
11.	Performance	Router shall support IPSLA or equivalent and Y.1731/ 802.1ag for performance monitoring	
12.	High Availability	Router should support Redundant Power Supply and should also support Online insertion and removal of same.	
13.	High Availability	Fan tray should be hot-swappable and should be a Field Replaceable Unit (FRU). The node can run indefinitely with a single fan failure. Shall Support hot-swappable for all modules. And secure normal operations when hot-swap event occurred	
14.	High Availability	Router shall support MPLS-TE with FRR for sub 50 msec protection.	
15.	High Availability	Router must support Traffic Engineering for node and link protection.	
16.	Protocol Support	Router shall support IPV4 and IPV6, IGMP V2/V3, Multicast Listener Discovery, IGMP and PIM, 6PE and 6VPE mode for IPV6 transport over IPV4 or equivalent, ECMP, LDP, BGP Prefix independent control (EDGE and	

S. No.	Parameter/requirement	Minimum Specifications/requirements	Compliance (Yes/No)
		Core) for IPV4 and IPV6, BGP, ISIS, OSPFv2 and V3, RSVP, VRRP and Traffic Engineering	
17.	Protocol Support	Router should support high availability for all BFD, BGP, OSPF and IS-IS and no packet loss during controller switch over.	
18.	Protocol Support	Router should support RFC 3107 of Carrying Label Information in BGP-4	
19.	Protocol Support	The Router should support Point to Point and Point to Multipoint LSP for Unicast and Multicast traffic.	
20.	Protocol Support	Router shall support layer3 and layer2 MPLS VPN.	
21.	QoS Features	Router shall support HQOS on all kind of interface in both ingress and egress direction. Similar QOS shall be supported for all type of interface including Bundled interfaces.	
22.	QoS Features	Shall support Ingress classification, marking and policing on physical interfaces and logical interfaces using source/destination IP subnet, protocol types (IP/TCP/UDP), source/destination ports, IP Precedence, MPLS EXP, DSCP,802.1p	
23.	QoS Features	Shall support Strict Priority Queuing or Low Latency Queuing to support real-time application like Voice and Video with minimum delay and jitter.	
24.	QoS Features	Congestion Management: WRED, Priority queuing, Class-based weighted fair queuing	
25.	Security & Management	Support Access Control List to filter traffic based on Source & Destination IP Subnet, Source& Destination Port, Protocol Type (IP, UDP, TCP, ICMP etc.) and Port Range etc. Should Support per-user Authentication, Authorization, and Accounting through RADIUS or TACACS and SNMPv1/v2/V3	
26.	Operating Environmental Requirements	0°C to 40°C operating temperature and 10 to 90% (+/- 5), non-condensing	
27.	Interface	The proposed router should be provided with the following minimum interfaces from day 1 . However, MSI should consider as per solution. - <ul style="list-style-type: none"> <li>• 4x10G ports populated with minimum 2 X 10G multimode transceiver and 1x10G SM transceiver</li> <li>• 4x1G SFP port</li> <li>• 4x 10/100/1000base-T Ethernet Ports.</li> </ul> MSI to evaluate the final termination required as per their solution design and provide the required transceivers.	
28.	Compliance	The proposed router shall support IEEE 1588v2 standard.	

### 2.3. Internet Router

S. No.	Parameter/ requirement	Minimum Specifications/requirements	Compliance (Yes / No)
1.	<b>Hardware Architecture</b>	Router should be chassis-based device with minimum 10 Gbps or 15 Mpps of throughput scalable up to 20 Gbps or 30 Mpps. It should have minimum 4 GB of RAM/ DRAM	
2.	<b>Hardware Architecture</b>	Following interfaces support required from Day-1: 2x 10G SFP+ based ports loaded with single mode transceiver, 3*1 GE & 3*1 G SFP-based transceiver	
3.	<b>Router Features</b>	Router has support for the following routing /WAN protocols: PPP/ MLPPP, HDLC	
4.	<b>Router Features</b>	Router should support protocols like RIP, OSPF, BGP, VRRP/HSRP, 802.1q, GRE, ACL's and NAT MPLS, traffic engineering, EoMPLS/VPLS/equivalent	
5.	<b>Router Features</b>	Router should be modular chassis-based device and should accommodate a combination of high-density 10G, Gigabit Ethernet, Fast Ethernet	
6.	<b>Router Features</b>	Router should support the RIPng & BGP for IPv6, OSPFv3, MPLS, BGP	
8.	<b>Router Features</b>	Router should support QoS classification and marking policy-based routing, IP precedence, DSCP, QoS -congestion management WRED/RED, Priority queuing/ class-based weighted for fair queuing	
9.	<b>Router Features</b>	The router should support time based controlled forwarding based on the time of day	
10.	<b>Router Features</b>	Router should support QoS features such as traffic prioritization, differentiated services, RSVP/WFQ/MRED	
11.	<b>Router Features</b>	Router should support for low latency queuing, Layer 2 and Layer 3 CoS/DSCP	
12.	<b>Router Features</b>	Router should have multicast routing protocols support: IGMPv1, v2 (RFC2236) PIM-SM (RFC2362) and PIM-DM/ Multicast VLAN registration	
13.	<b>Router Features</b>	Router should support tunnelling protocols like IPsec VPN, GET VPN or equivalent, Multi Point VPN and encryption mechanisms like DES, 3DES, AES (128 and 256Bit)	
14.	<b>Router Features</b>	Router should be IPv6 enabled	
15.	<b>Management</b>	Router should support management protocol: SNMP v1/v2/v3, CLI (Telnet/Console), TFTP update and configured file management	
16.	<b>Management</b>	Router should be able to support pre-configured action on events such as changing routes / changing routing metric	

## 2.4. Internet Firewall

S. No.	Parameter/ requirement	Minimum Specifications/requirements	Compliance (Yes / No)
1.	<b>Hardware Architecture</b>	The appliance-based security platform should provide firewall, Application Control and Malware Protection functionality.	
2.	<b>Hardware Architecture</b>	The appliance should have minimum 8x1/10G port switch multi-mode transceiver from day one	

S. No.	Parameter/ requirement	Minimum Specifications/requirements	Compliance (Yes / No)
3.	<b>Hardware Architecture</b>	The appliance hardware should be a multicore CPU architecture with a hardened 64-bit operating system to support higher memory	
4.	<b>Hardware Architecture</b>	Proposed Firewall should be open architecture based on multi-core CPU's to protect & scale against dynamic latest security threats.	
5.	<b>Performance &amp; Scalability</b>	Solution should support minimum 4 Gbps of NGFW / Threat Prevention real-world / production performance	
6.	<b>Performance &amp; Scalability</b>	Firewall should support at least 18,00,000 concurrent sessions scalable up to 36,00,000 concurrent sessions	
7.	<b>Performance &amp; Scalability</b>	Firewall should support at least 1,00,000 connections per second	
8.	<b>Performance &amp; Scalability</b>	Firewall should support Active-Standby/ Active-Active high availability deployment modes.	
9.	<b>Performance &amp; Scalability</b>	Firewall should have integrated redundant / hot-swappable power supply	
10.	<b>Performance &amp; Scalability</b>	Firewall should have integrated redundant / hot-swappable fan trays/ Modules	
11.	<b>Firewall Features</b>	Firewall should support creating access-rules with IPv4 & IPv6 objects, user/groups, application, URL, zones, VLAN, etc.	
12.	<b>Firewall Features</b>	Firewall should support Nat66 (IPv6-to-IPv6), Nat 64 (IPv6-to-IPv4), Nat46 (IPv4-to-IPv6)/ Nat44 (IPv4-to-IPv6) functionality	
13.	<b>Firewall Features</b>	Should support Static, RIP, OSPF, OSPFv3 and BGP, BGPv4/ BGPv6	
14.	<b>Firewall Features</b>	Should support Multicast protocols like IGMP, PIM, etc.	
15.	<b>Firewall Features</b>	Should support capability to integrate with other security solutions to receive contextual information/ REST API for integration	
16.	<b>Firewall Features</b>	Should support more than 3000 (excluding custom application signatures) distinct application signature as application detection mechanism to optimize security effectiveness	
17.	<b>Firewall Features</b>	Should be capable of supporting at least 60-70 number of URL filtering categories	
18.	<b>Firewall Features</b>	Should be capable of automatically providing the appropriate inspections and protections for traffic sent over non-standard communications ports.	
19.	<b>Firewall Features</b>	Should be able to link Active Directory and/or LDAP usernames to IP addresses related to suspected security events.	
20.	<b>Firewall Features</b>	Should be capable of detecting and blocking IPv6 attacks.	
21.	<b>Firewall Features</b>	Should support the capability to quarantine end point by integrating with other security solution	

S. No.	Parameter/ requirement	Minimum Specifications/requirements	Compliance (Yes / No)
22.	<b>Firewall Features</b>	The solution must provide IP reputation feed that comprised of several regularly updated collections of poor reputation of IP addresses determined by the proposed security vendor	
23.	<b>Firewall Features</b>	Solution shall have capability to analyse and block TCP/UDP protocol to identify attacks and malware communications. At minimum, the following protocols are supported for real-time inspection, blocking and control of download files: HTTP, HTTPS, SMTP, SMTPs, POP3, IMAP and FTP	
24.	<b>Firewall Features</b>	The detection engine should support capability of detecting and preventing a wide variety of threats (e.g., network probes/reconnaissance, VoIP attacks, buffer overflows, P2P attacks, etc.).	
25.	<b>Firewall Features</b>	The detection engine must incorporate multiple approaches for detecting threats, including at a minimum exploit-based signatures, vulnerability-based rules, protocol anomaly detection, and behavioural anomaly detection techniques.	
26.	<b>Firewall Features</b>	Should support Open based Application ID / Custom Application Signature and ability to easily customize security to address new and specific threats and applications quickly	
27.	<b>Management</b>	The management platform must be accessible via web-based / management server/secure client software interface and ideally with no need for additional client software	
28.	<b>Management</b>	The management appliance should have 2 X 1G port and integrated / separate redundant power supply from day one	
29.	<b>Management</b>	The management platform must be able to store record of 15000 user or more	
30.	<b>Management</b>	The management platform must provide a highly customizable dashboard.	
31.	<b>Management</b>	The management platform must domain multi-domain management	
32.	<b>Management</b>	The management platform must provide centralized logging and reporting functionality	
33.	<b>Management</b>	The management platform must provide multiple report output types or formats, such as PDF, HTML, and CSV.	
34.	<b>Management</b>	The management platform must support multiple mechanisms for issuing alerts (e.g., SNMP, e-mail, SYSLOG).	
35.	<b>Management</b>	The management platform must provide built-in robust reporting capabilities, including a selection of pre-defined reports and the ability for complete customization and generation of new reports.	

S. No.	Parameter/ requirement	Minimum Specifications/requirements	Compliance (Yes / No)
36.	Management	The management platform support running on-demand and scheduled reports	
37.	Management	The management platform must provide risk reports like advanced malware, attacks and network threats	

## 2.5. Intranet Firewall

S. No.	Parameter/ requirement	Minimum Specifications/requirements	Compliance (Yes / No)
1.	Hardware Architecture	The appliance-based security platform should provide firewall, Application Control.	
2.	Hardware Architecture	The appliance should support at least 4x1G Ethernet Ports (scalable to 8 X 1G) & 4 X 10G ports (scalable to 8 X 10G) with multi-mode transceiver from day one	
3.	Hardware Architecture	The appliance hardware should be a multicore CPU architecture with a hardened 64-bit operating system to support higher memory	
4.	Performance & Scalability	Should support 6 Gbps of NGFW / Threat Prevention) real-world / production performance	
5.	Performance & Scalability	Firewall should support at least 25,00,000 concurrent sessions scalable upto 50,00,000 concurrent sessions	
6.	Performance & Scalability	Firewall should support at least 1,20,000 connections per second	
7.	Performance & Scalability	Firewall should support Active-Standby/ Active-Active/Clustering high availability deployment modes.	
8.	Performance & Scalability	Firewall should have integrated redundant / hot-swappable power supply	
9.	Performance & Scalability	Firewall should have integrated redundant / hot-swappable fan tray / modules	
10.	Firewall Features	Firewall should support creating access-rules with IPv4 & IPv6 objects, user/groups, application url, zones, vlan, etc.	
11.	Firewall Features	Firewall should support Nat66 (IPv6-to-IPv6), Nat 64 (IPv6-to-IPv4), Nat46 (IPv4-to-IPv6)/Nat44 (IPv4-to-IPv6) functionality	
12.	Firewall Features	Should support Static, RIP, OSPF, OSPFv3 and BGP, BGPv4/BGPv6	
13.	Firewall Features	Should support Multicast protocols like IGMP, PIM, etc.	
14.	Firewall Features	Should support capability to integrate with other security solutions to receive contextual information	
15.	Firewall Features	Should be capable of automatically providing the appropriate inspections and protections for traffic sent over non-standard communications ports.	
16.	Firewall Features	Should be able to link Active Directory and/or LDAP usernames to IP addresses related to suspected security events.	
17.	Firewall Features	Should be capable of detecting and blocking IPv6 attacks.	



S. No.	Parameter/ requirement	Minimum Specifications/requirements	Compliance (Yes / No)
18.	<b>Firewall Features</b>	Should support the capability to quarantine end point by integrating with other security solution/ NAC solutions	
19.	<b>Firewall Features</b>	The solution must provide IP reputation feed that comprised of several regularly updated collections of poor reputation of IP addresses determined by the proposed security vendor	
20.	<b>Firewall Features</b>	The Appliance OEM must have its own threat intelligence analysis Centre and should use the global footprint of security deployments for more comprehensive network protection.	
21.	<b>Firewall Features</b>	The detection engine should support capability of detecting and preventing a wide variety of threats (e.g., network probes/reconnaissance, VoIP attacks, buffer overflows, P2P attacks, etc.).	
22.	<b>Firewall Features</b>	The detection engine must incorporate multiple approaches for detecting threats, including at a minimum exploit-based signatures, vulnerability-based rules, protocol anomaly detection, and behavioural anomaly detection techniques. I	
23.	<b>Firewall Features</b>	Solution shall have capability to analyze and block TCP/UDP protocol to identify attacks and malware communications. At minimum, the following protocols are supported for real-time inspection, blocking and control of download files: HTTP, SMTP, POP3, IMAP, NetBIOS-SSN and FTP	
24.	<b>Management</b>	The management platform must be accessible via a web-based interface and ideally with no need for additional client software	
25.	<b>Management</b>	The management appliance should have 2 X 1G port and integrated / separate redundant power supply from day one	
26.	<b>Management</b>	The management platform must be able to store record of 15000 user or more	
27.	<b>Management</b>	The management platform must provide a highly customizable dashboard.	
28.	<b>Management</b>	The management platform must provide centralized logging and reporting functionality	
29.	<b>Management</b>	The management platform must be capable of role-based administration, enabling different sets of views and configuration capabilities for different administrators subsequent to their authentication.	
30.	<b>Management</b>	Should support troubleshooting techniques like Packet tracer and capture	
31.	<b>Management</b>	The management platform must provide multiple report output types or formats, such as PDF, HTML, and CSV.	
32.	<b>Management</b>	The management platform must support multiple mechanisms for issuing alerts (e.g., SNMP, e-mail, SYSLOG).	



S. No.	Parameter/ requirement	Minimum Specifications/requirements	Compliance (Yes / No)
33.	Management	The management platform must provide built-in robust reporting capabilities, including a selection of pre-defined reports and the ability for complete customization and generation of new reports.	
34.	Management	The management platform support running on-demand and scheduled reports	
35.	Management	The management platform must provide risk reports like advanced malware, attacks and network threats	

## 2.6. Network Intrusion Prevention System

S. No.	Parameter/ requirement	Minimum Specifications/requirements	Compliance (Yes / No)
1.	Hardware Architecture	Should be a hardware-based appliance and should not be a part of any other appliance	
2.	Hardware Architecture	The hardware should have minimum of 4x1G/ 10G ports and 4X10G SFP/ SFP+ (populated) ports	
3.	Features	The hardware should detect intrusion attempts/ discerns between the various types and risk levels including unauthorized access attempts, pre-attack probes, suspicious activity, DDoS, vulnerability exploitation and zero-day attacks, Worm, Phishing, Spyware, Virus, Trojan, P2P, VoIP, Backdoor, Reconnaissance, Bandwidth Hijacking, Cross-site scripting, SQL Injection, malformed traffic etc.	
4.	Features	The hardware should detect, and block all known, high risks along with their underlying vulnerability	
5.	Features	The hardware should support traffic inspection for IPv6, IPv4, and tunnelled: 4in6, 6in4, 6to4 traffic	
6.	Features	The hardware should have an integration mechanism, preferably in the form of open APIs and/or standard interfaces, to enable events and log data to be shared with external network and security management applications, such as Security Information and Event Managers (SIEMs), and log management tools	
7.	Features	The solution should support signatures, Filters, protocol anomaly, vulnerabilities and traffic anomaly filtering methods to detect and protect attacks, malicious traffic and zero-day threat protection with the help of analytical/simulation mechanism	
8.	Performance & Scalability	The appliance should support a throughput of minimum 1 Gbps scalable to 4 Gbps within the same box and latency should be <50 ms for all kinds of real-world traffic/production performance in Active-Active or Active-Standby mode	

S. No.	Parameter/ requirement	Minimum Specifications/requirements	Compliance (Yes / No)
9.	<b>Performance &amp; Scalability</b>	The appliance should support minimum of 2,00,000 connections per second scalable upto 6,00,000 connections per second without changing the hardware	
10.	<b>Performance &amp; Scalability</b>	Should support VA scanners, network action set such as Block (drop packet), Block (TCP reset), permit, trust, notify, trace (Packet Capture), rate limit etc.	

## 2.7. Blade Servers (Web, Application, Database, Platform Solutions etc.)

S. No.	Parameter/ requirement	Minimum Specifications/requirements	Compliance (Yes / No)
1.	<b>CPU</b>	Each blade shall have two numbers of latest compatible chipset Processors with Min. 20 cores per processor each having Min. 2.0 GHz processor.	
2.	<b>Motherboard</b>	Latest compatible chipset compatible with the offered processors.	
3.	<b>Memory</b>	Min. 24 DIMM slots, should be provided with 256 GB RAM using DDR4 DIMM's operating at 2666 MT/s (depending on processor model)	
4.	<b>Memory Protection</b>	Advanced ECC with multi-bit error protection	
5.	<b>Hard disk drive with carrier</b>	2X500 GB or higher	
6.	<b>Storage Controller</b>	SAS Raid Controller with RAID 0/1 with 2 GB Cache or above	
7.	<b>Networking features</b>	The server should provide a minimum of 40 Gbps or dual port of 20/ 25Gbps each Converged network adapter ports.	
8.	<b>Interfaces</b>	Minimum of 1X internal USB 3.0 port,1X internal SD card slot	
9.	<b>Bus Slots</b>	Minimum of 2 Nos of PCIe 3.0 slots	
10.	<b>Redundancy</b>	The blades to be provided with port level/ card level redundancy	
11.	<b>OS Support</b>	Microsoft Windows Server 2016 Std or above edition, Windows Server Hyper-V, Redhat Enterprise Linux, SuSE Linux Enterprise Server	
12.	<b>Virtualization Support</b>	VMWARE ESX/ESXi, Microsoft Hyper-V, Citrix etc.	
13.	<b>Connectivity</b>	2 X 20 GbE or 2 x 25 GbE network ports or higher	
14.	<b>Systems Management</b>	Smart Embedded Systems Management should be able to automate task like discovery deploy monitor and update.	

S. No.	Parameter/ requirement	Minimum Specifications/requirements	Compliance (Yes / No)
		Should not be dependent on agents to for life cycle management.	
		Should be able to provide Single console to manage Servers.	
		Power management tool – Single interface to optimize and control every usage	
		Should be able to integrate to 3 <sup>rd</sup> party management tools.	
15.	<b>Remote Management</b>	Vendor should provide embedded features that help to manage Servers in physical, local and remote environments, operating in-band or out-of-band, with or without a systems management software agent.	
		Should include Power Management, necessary licenses should be included.	
		Should support remote scripted reconfiguration tools	
		Should be able to monitor all systems components (BIOS, HBA's, NICs)	
16.	<b>Security</b>	Should provide effective protection, reliable detection & rapid recovery using: <ul style="list-style-type: none"> <li>- Signed firmware updates</li> <li>- Secure default passwords</li> <li>- Configuration and firmware drift detection</li> <li>- Persistent event logging including user activity</li> <li>- Secure alerting</li> <li>- Automatic BIOS recovery</li> <li>- Rapid OS recovery</li> </ul>	
17.	<b>Systems Management Software</b>	The server should come with systems management software to provide update management, configuration management, patch management and virtualization management.	
18.	<b>Accessories</b>	All the necessary tools & tackles licenses, cables/ connectors for Ethernet/ Fibre/ USB/ Power etc. required for making the system operational shall be provided by the bidder.	

## 2.8. SAN Storage

S. No.	Parameter/ requirement	Minimum Specifications/requirements	Compliance (Yes / No)
1.	<b>SAN Storage</b>	Proposed make of SAN storage system should be from reputed brands of Storage System's OEM. For investment rationalization, the proposed SAN should be modular & scalable in nature wherein the Storage can be scaled by adding capacity to the controllers & adding/ upgrading controllers to the FC SAN & IP SAN fabric with all the controllers managed from a One single GUI based management Interface. All requirements specified are minimum.	
2.	<b>SAN Controllers</b>	Hot-pluggable Active-Active Storage Controllers	

S. No.	Parameter/requirement	Minimum Specifications/requirements	Compliance (Yes / No)
3.	<b>Backend Connectivity</b>	To eliminate single point of failure from the controller to the backend storage, each storage/controller must have redundant /dual controller of 12Gb/s or higher backend connectivity/storage drives i.e. 2 X 12Gb/s SAS ports or better per controller/per controller pair	
4.	<b>Frontend Host Interface</b>	Minimum 4 Number of FC SAN Host Ports @16 Gbps or higher and Minimum 2 Number of IP SAN Host Ports @10Gbps or higher per controller.	
5.	<b>Drives</b>	Capacity: The storage must support SAS, SSD and NL SAS disks simultaneously. For balanced performance, rebuild time & capacity, the storage should be provisioned with minimum 1300 TB of Usable capacity (In RAID 6, 8D+2P configuration) with maximum 8TB/ 12 TB NL-SAS drives. Minimum two spare drives of proposed disk type to be provided for every Controller. 2 Drives of proposed capacity to be configured & kept at the site as cold spares.	
6.	<b>Cache</b>	Cache: minimum 96GB DRAM cache across dual controller. Battery/Flash based cache protection for minimum 72 hours should be provided. Cache specified is minimum. Bidders must offer more cache if required for the proposed solution.	
7.	<b>RAID levels support</b>	Should support various RAID levels (5,6,10) or equivalent.	
8.	<b>Rack</b>	Storage Array must be modular & Rack mountable.	
9.	<b>Scalability</b>	The capacity of the proposed configuration should be 100% scalable with the proposed disk configuration. No additional software/feature license or controller(s) should be required for further 100% capacity expansion. It should support SSD, NL-SAS and enterprise SAS Drives in the same enclosure for future expansions.	
10.	<b>Enterprise SAN features</b>	Enterprise SAN Storage should support hot plug of controllers, hard disk drives, power supplies & fans. Since the video streams will be on this storage, the proposed storage must have online storage OS & drive firmware update/upgrade capability.	
11.	<b>Fans and Power supplies</b>	Redundant power supply and cooling fans.	
12.	<b>Software Licenses</b>	For investment protection, all licensed features of the array must be enabled as perpetual license for full scalable capacity of the proposed storage array.	
13.	<b>Storage Resource Management Software</b>	All the necessary software (GUI Based) to configure and manage the storage capacity, RAID configuration, Snapshots, clones, Thin Provisioning, Role based Access Control (RBAC) with audit Logs, Remote replication, VAAI, ODX etc. are to be provided.	

S. No.	Parameter/ requirement	Minimum Specifications/requirements	Compliance (Yes / No)
14.	Others/Misc.	<ul style="list-style-type: none"> <li>Storage must be supplied with all necessary software for carrying out all management (configuration, diagnostics etc.) activities on the storage.</li> <li>All required cables must be supplied.</li> <li>Necessary Mounting Kit to install the SAN storage in a 42U rack must be supplied.</li> </ul>	
15.	Integration	The proposed storage solution must integrate with the Unified All Flash Storage through the VMS software for cloud backup & replication.	
16.	Performance	Storage Solution should be sized to accept 100% writes from minimum 1400 Number of IP cameras @3Mb/s. On top of performance required to write from cameras the storage Solution should be sized to accept 100% headroom to accommodate future growth.	

## 2.9. SAN Switch

S. No.	Parameter/ requirement	Minimum Specifications/requirements	Compliance (Yes / No)
1.	Hardware Architecture	The fibre channel switch must be rack mountable. Thereafter, all reference to the 'switch' shall pertain to the 'fibre channel switch'	
2.	Hardware Architecture	The switch to be configured with minimum of 48 ports 16 Gbps FC configuration backward compatible to 4/8/16	
3.	Hardware Architecture	All 48 x FC ports for device connectivity should be 4/8/16 Gbps auto-sensing Fibre Channel ports	
4.	Hardware Architecture	The switch must have redundant power supply & fan module without resetting the switch, or affecting the operations of the switch	
5.	SAN Switch Features	The switch must be able to support non-disruptive software upgrade.	
6.	SAN Switch Features	The switch must be able to support state full process restart	
7.	SAN Switch Features	The switch must be capable of creating multiple hardware-based isolated Virtual Fabric (ANSI T11) instances. Each Virtual Fabric instance within the switch should be capable of being zoned like a typical SAN and maintains its own fabric services, zoning database, Name Servers and FSPF processes etc. for added scalability and resilience	
8.	SAN Switch Features	The switch must be capable of supporting hardware-based routing between Virtual Fabric instances	
9	SAN Switch Features	The switch must support graceful process restart and shutdown of a Virtual Fabric instance without impacting the operations of other Virtual Fabric instances	
10	SAN Switch Features	The switch shall support Small Form Factor Pluggable (SFP) LC typed transceivers	

S. No.	Parameter/ requirement	Minimum Specifications/requirements	Compliance (Yes / No)
11	<b>SAN Switch Features</b>	The switch must support hardware ACL-based Port Security, Virtual SANs (VSANs)/ Virtual Fabric and Port Zoning	
12	<b>SAN Switch Features</b>	The Switch must support default zoning, port/WWN zoning, broadcast zoning	
13	<b>SAN Switch Features</b>	Should support features to automated configuration deployment and fabric configuration services	
14	<b>SAN Switch Features</b>	Inter-switch links must support the transport of multiple Virtual Fabrics/ VSAN between switches, whilst preserving the security between Virtual Fabrics/ VSAN	
15	<b>SAN Switch Features</b>	The switch must support routing between Virtual Fabric/ VSAN instance in hardware	
16	<b>SAN Switch Features</b>	The switch shall support FC-SP for host-to-switch and switch-to-switch authentication.	
17	<b>SAN Switch Features</b>	The switch must be able to load balance traffic through an aggregated link with Source ID and Destination ID. The support for load balancing utilizing the Exchange ID must also be supported	
18	<b>SAN Switch Features</b>	The switch must be equipped with congestion control mechanisms such that it is able to throttle back traffic away from a congested link	
19	<b>SAN Switch Features</b>	The switch must be capable of discovering neighbouring switches and identify the neighbouring Fibre Channel or Ethernet switches	
20	<b>SAN Switch Features</b>	The switch should support IPv6. It should support native switch-based REST APIs	
21	<b>SAN Switch Features</b>	The bidder must provide at least 2 of these switches	
22	<b>Performance &amp; Scalability</b>	The interface requirement mentioned here is the minimum. If the solution requires a greater number of interfaces (considering 100% redundancy) then the same should be quoted by the bidder	

## 2.10. Unified storage with SAN Switch (75TB for Video and Application Data)

S. No.	Parameter/ requirement	Minimum Specifications/requirements	Compliance (Yes / No)
1.	<b>Unified Storage</b>	Proposed make of Unified All Flash storage system should be from reputed brands of Storage System's OEM. For investment rationalization, the proposed Unified All Flash storage system should be modular & scalable in nature wherein the Storage can be scaled by adding capacity to the controllers & adding/ upgrading controllers to the FC SAN & IP SAN fabric as well IP NAS network with all the proposed controllers managed from a One single GUI based management Interface. All requirements specified are minimum.	

S. No.	Parameter/requirement	Minimum Specifications/requirements	Compliance (Yes / No)
2.	<b>Solution Type</b>	Bidder is expected to provide Unified Storage solution should have block and file access with host connectivity for FC, iSCSI, CIFS and NFS. Storage should have the capability to scale up or scale-out. The unified storage solution must be dedicated appliance with specifically optimized OS to provide both SAN and NAS functionalities. Proposed storage system must have minimum 2 Unified controllers. The all proposed All Flash storage system should be categorized as All Flash Array/Solid State Array by the OEM & optimised for Solid State Drives (SSDs).	
3.	<b>Storage Size</b>	Storage should be supplied with 75TB of usable space with maximum 8TB, 12Gbps SSD Drives. Usable space is space without space efficiencies/gains from Dedupe, Compression etc.	
4.	<b>Hardware Platform</b>	Rack mounted form-factor Modular design to support disk drives expansion 2 X 12Gbps SAS or higher SAS ports for Backend disk connectivity. The proposed storage must scale up to minimum of 1.5 times number of SSD drives proposed. Hot spares should be configured as per OEM best practices & 1 cold spare disk should be offered onsite with the storage.	
5.	<b>Controllers</b>	Unified Storage controller nodes must be configured in Dual-Active configuration. Storage controller must have minimum 32GB on-board Protected cache per controller. The controllers/ Storage nodes should be upgradable seamlessly, without any disruptions/downtime to production workflow for performance, capacity enhancement and software/firmware upgrade. In case bidder is offering different controllers for SAN & NAS features, every controller in the solution must have same cache & ports available to hosts.	
6.	<b>Front end host Ports</b>	Minimum 4 X 16Gbps FC, 4 X 10Gbps IP Ports	
7.	<b>Operating System and Virtualization Support</b>	The storage solution should support all latest operating system and cluster environments. The unified storage solution should support virtual infrastructure (like VMware / Hyper-V etc). Should have capabilities for booting VMs from the SAN. Should be supplied with virtualization aware APIs for provisioning and managing the storage array from the virtual infrastructure.	
8.	<b>Unified Protocol Support</b>	Storage should support protocol – FC, iSCSI, NFSv3, CIFS and SMB	
9.	<b>Management Protocol Support</b>	SNMP and NTP Synchronization	
10.	<b>RAID support</b>	Should support various RAID levels (5,6,10) or equivalent	



S. No.	Parameter/requirement	Minimum Specifications/requirements	Compliance (Yes / No)
11.	<b>Multi-pathing and SAN Security</b>	The storage should support multi-pathing software from all leading OEM's. The Storage should provide provision LUN Masking and SAN Security	
12.	<b>Redundancy and High Availability</b>	The Storage System should be able to protect the data against single point of failure with respect to controller, disks, cache, connectivity interfaces, fans and power supplies. Storage should support non-disruptive online microcode upgrades & support load balancing and failover without any limitation on SAN and NAS provisioned capacity.	
13.	<b>Management software</b>	<ul style="list-style-type: none"> <li>All the necessary software as specified in this RFP including capability to configure and manage the storage space, RAID configuration, logical drives allocation, snapshots etc, single Command and GUI and Integrated Web Console for entire storage system for configuration for both file &amp; block storage and associated functionalities including deployment, automation, provisioning, and protection and monitoring management.</li> <li>Solution should offer real-time performance monitoring tools giving information on CPU utilization, volume throughput, I/O rate and latency reports of at least 12 months.</li> <li>Should be able to create instantaneous or Point in Time Snapshot copies of volumes which can be either a full clone or incremental snapshot of the volumes.</li> </ul>	
14.	<b>Supported Software and licenses from day one for the total configured capacity and configured Protocols</b>	Thin Provisioning, Inline Compression, Inline Deduplication, snapshot, restore snapshot, Cloning and application & VM aware backup. Storage system should support remote Asynchronous replication for Disaster Recovery with bandwidth optimization over WAN. Storage should be configured with data at rest encryption and key management.	
15.	<b>Data Protection</b>	The storage array must have complete cache protection using mechanism like mirroring/ de-staging/coherency for both file & block provisioned capacity. The cache data shall not be lost in the case of power failure.	

### 2.11. Blade Chassis with Switch and Virtual KVM

S. No.	Parameter/requirement	Minimum Specifications/requirements	Compliance (Yes / No)
1.	<b>Enclosure</b>	Blade chassis shall be 19" Electronic Industries Alliance Standard Width rack mountable and provide appropriate rack mount kit	



S. No.	Parameter/ requirement	Minimum Specifications/requirements	Compliance (Yes / No)
2.	<b>Enclosure</b>	The enclosure Should support full height/width and half height/width blades in the same enclosure, occupying a max of 10U rack height, it should support minimum 8 blade servers	
3.	<b>Power</b>	The enclosure should be populated fully with power supplies of the highest capacity & energy efficiency of platinum rating.	
4.	<b>Power</b>	The power subsystem should support N + N, N+1 power redundancy (where N is greater than 1) for a fully populated chassis with all servers configured with the highest CPU configuration (150 W and above),	
5.	<b>Cooling</b>	Each blade enclosure should have a cooling subsystem consisting of redundant hot pluggable fans or blowers enabled with technologies for improved power consumption and acoustics	
6.	<b>Blade Support</b>	Enclosure should support all Intel Xeon Scalable processors based 2 CPU and 4 CPU blades	
7.	<b>Blade Support</b>	Should support built-in management software in redundancy	
8.	<b>Blade Support</b>	Should provide single management console for all the blade servers across multiple chassis.	
9.	<b>Converged Module</b>	The chassis should be provided with redundant modules/ ports for connectivity	
10.	<b>Converged Module</b>	Chassis should have sufficient number of redundant converged FCOE modules or ports to provide a FCOE uplink bandwidth of minimum 20Gbps per blade server and 10Gbps or higher sustained per blade server (with 1 module or port failure) for a fully populated chassis for converged Traffic.	
11.	<b>Chassis Management software</b>	Blade chassis management solution may be provided internal / external to the chassis and must provide single console for managing minimum up to 4 chassis for all associated components like Blade Servers, raid settings, NIC/HBA cards, IO Modules, Power supplies, Fans. Licenses to support the features to be supplied for fully populated chassis.	
12.	<b>Chassis Management software</b>	Centralized Redundant Management solution should be provided so that management of all blade servers across multiple chassis within Data Centre can be done from single console. If the management system runs as a virtual machine, then all hardware and software licenses to enable this should be included	
13.	<b>Chassis Management software</b>	Should support auto-discovery of resources within an enclosure and on multiple connected enclosures.	

S. No.	Parameter/ requirement	Minimum Specifications/requirements	Compliance (Yes / No)
14.	<b>Chassis Management software</b>	Solution should support templates to quickly make changes to the infrastructure. the server BIOS version, MAC ID, NIC firmware version, WWPN, FC-HBA firmware version, Adapter QoS, Management module firmware version, UUIDs, Server Boot Policies, KVM IPetc. of the infrastructure required for workload	
15.	<b>Chassis Management software</b>	The management software should be used to create resource pools and have the blade resources assigned to the respective resource pools & re-assign resources to effectively utilize infrastructure	
16.	<b>Chassis Management software</b>	Role Based Access Control with at least 6 users to define roles and privileges and remote management capabilities including remote KVM should be included	

## 2.12. Smart Network Rack

S. No.	Minimum specifications/requirements	Compliance (Yes / No)
<b>1</b>	<b>Requirements</b>	
1.1	Smart Integrated Infrastructure/Smart Racks with in-built hot and cold aisle containment of racks	
1.2	Intelligent Integrated Infrastructure essentially should include internal redundant or backup power supplies, environmental controls (Precision Air-conditioning, Fire suppression, smoke detection, water leak detection and humidity sensors). Critical systems like UPS and Precision Air-conditioning systems should have N+N topology	
<b>2</b>	<b>Smart Integrated Infrastructure/Smart Racks shall have following components</b>	
2.1	<b>In-Row closed loop Air-Conditioning</b>	
2.1.1	Data center server and network racks should be equipped with In-row variable scroll cooling units to provide closed loop precision cooling system which should be able to cool the equipment's uniformly	
2.1.2	Each Precision Air Cooling should be N+N topology with following features: <ul style="list-style-type: none"> <li>• Cooling System should be variable type in N+1 Topology</li> <li>• Inbuilt Heater and Humidifier</li> <li>• Outdoor Unit</li> </ul>	
2.2	<b>Power Distribution</b>	
2.2.1	Intelligent Rack PDU (Vertical): 02 Nos. for each Rack (each rack is having two PDUs)	
2.3	<b>Main Electrical Panel and Cabling</b>	
2.3.1	DB panel should be mounted on to utility rack/room wall with all internal cabling integrated into the same. Essential MCB/MCCB should be provided with electrical system. All the PDUs inside all racks should be connected by the UPS. DB panel	

S. No.	Minimum specifications/requirements	Compliance (Yes / No)
	mounted on Utility rack shall be covered with NOVEC 1230 Gas based fire suppression system	
2.4	<b>Fire Detection and Suppression</b>	
2.4.1	Fire detection and suppression system: Fire detection and suppression system should be mounted in panel adjacent to Smart Racks to avoid consumption of any usable U space an In-rack built-in feature of solution. It should have Fire alarm and fire suppression unit and the fire suppression agent should be NOVEC 1230 Gas	
2.5	Blanking Panel: 70%	
2.6	<b>Environmental Controls</b>	
2.6.1	Each set of intelligent rack should include basic environmental controls: <ul style="list-style-type: none"> <li>• Smoke Detector</li> <li>• Water Leak Detection system</li> <li>• Temperature/ Humidity Sensor</li> <li>• Door Sensor</li> <li>• Alarm beacon</li> </ul>	
2.6.2	VESDA for the Smart Racks for early detection of the fire incident	
2.7	<b>Racks</b>	
2.7.1	42 U racks of dimension 600 mm x 1000 mm: as per city BoQ	
2.7.2	These rack enclosures should have both integrated cold aisle & hot aisle containment of minimum 300mm each for proper airflow	
2.8	<b>Monitoring</b>	
2.8.1	Each set of Integrated racks should have IP based monitoring facility of all the passive parameters inside racks.	
2.8.2	Capable for Email Alerts	
2.8.3	Monitoring unit should not occupy more than 1U space	
2.9	<b>Other features:</b>	
2.9.1	The Smart Racks shall provide much functionality and some of the key functionalities: both Cold aisle & hot aisle containment should be of minimum 300 mm each for airflow, Airtight thermally insulated cabinet, remote management	
2.9.2	Shall have provision to add an extra rack in future. It should be flexible, adaptable, controllable infrastructure	
2.9.3	Rack based Biometric access control system shall be provided and controlled by access control panel with access control for both front as well as rear doors	
2.9.4	Critical Component's for Smart Racks (Racks, rack PDU, Cooling, UPS and monitoring system) should be from same & single OEM for seamless integration	
2.9.5	IP based access control with user exclusive authentication	
2.9.6	Monitoring SNMP enablement feature to connect to any 3rd party BMS over SNMP	
2.9.7	HMI - Graphical User Interface for Smart Racks monitoring	

S. No.	Minimum specifications/requirements	Compliance (Yes / No)
2.9.8	Electrical Distribution board within Utility Cabinet to have fire detection & Novec Based Fire Suppression system	
2.9.9	Status based LED Lights	
<b>2.10</b>	<b>UPS:</b>	
2.10.1	UPS system should be Online based UPS with $\geq 92\%$ efficiency in N+N redundancy configuration with battery back-up as per RFP with lithium-ion/SMF/VRLA batteries	
2.10.2	Other commonly required features of UPS system are as follows:	
2.10.3	The UPS should be 19" Rack mountable and should not consume more than 2U per UPS or higher	
2.10.4	True On-line UPS with input range as Input Standard voltage, 380/400/415 V 3 Phase, 3 or 4 wire, +10 %, -5%	
2.10.5	Input Frequency, 50 Hz, +5% or -5%	
2.10.6	Output Frequency, 50 Hz, +0.25Hz to 0.5Hz	
2.10.7	Noise (dB): < 60dB	
2.10.8	System Efficiency at Full Load: $\geq 92\%$	
2.10.9	Protection Level: IP 20	
2.10.10	Electromagnetic Compatibility: IEC/EN62040-1-2, IEC/EN61000-3-11, IEC/EN61000-3-12, YD/T1095-2008 and Safety: IEC/EN62040-1-1	
2.10.11	Output voltage distortion: <2% total harmonic distortion (THD) for 100% linear loads; <5% THD for 100% non-linear loads	

### 3. City Datacentre Passive Infra Equipment's

#### 3.1. Diesel Generator

S. No.	Parameter/ requirement	Minimum Specifications/requirements	Compliance (Yes / No)
<b>1.</b>	<b>Design</b>	Water cooled, Naturally Aspirated 1500 RPM. under NTP conditions of BS: 5514, with Dry Type Air Cleaner, Compact Radiator with Recovery Bottle and Pusher type Fan, Engine with Coolant, Engine mounted panel with wiring harness, Holset Coupling and Industrial Silencer, as per engine manufacturers design standards. Power output guaranteed within 0 to +2 % and can be operated up to 3130 Mt. altitude and no de-rating for ambient temperature or humidity. The DG units should come with sound proofing as per the standards	
<b>2.</b>	<b>Alternator</b>	Standard design Alternator, rated at 0.8 PF, 415 Volts, 3 Phase, 4 wires, 50 cycles/sec	

S. No.	Parameter/ requirement	Minimum Specifications/requirements	Compliance (Yes / No)
3.	<b>Alternator</b>	1500 RPM, self-excited and self-regulated, with brushless excitation	
4.	<b>Alternator</b>	Self- ventilated, Screen Protected Drip Proof,	
5.	<b>Alternator</b>	Insulation Class “H”,	
6.	<b>Alternator</b>	enclosure IP 23	
7.	<b>Alternator</b>	The A.C. Generator shall be Horizontal foot mounted single bearing type and shall be fitted with Automatic Voltage Regulator (AVR) for Voltage regulation of +/- 1% or better. The Alternator generally conforms to BS: 5000/IS: 4722 and suitable to deliver output of suitable engine capacity	
8.	<b>Base Frame</b>	Sturdy, fabricated, welded construction, channel iron Base Frame for mounting the above Engine and Alternator	
9.	<b>Control Panel</b>	Cubicle type, floor mounting Control Panel, with hinged doors, bottom gland plate and accommodating the following: <ul style="list-style-type: none"> <li>○ 1-No. ACB or Moulded Case Circuit Breaker</li> <li>○ 3-No.’s Ammeters /1 No. Ammeter with Selector Switch</li> <li>○ 1 No. Voltmeter with Selector Switch</li> <li>○ 1 No. frequency meter</li> <li>○ 1 Set Pilot Lamps LOAD ON/GENERATOR ON</li> <li>○ 1 Set Instrument Fuses</li> </ul>	
10.	<b>Fuel Tank</b>	Necessary liters capacity Fuel Tank with mounting brackets to run for 8 hours, complete with level indicator, fuel inlet and outlet, air vent, drain plug, inlet arrangement for direct filling and set of fuel hoses for inlet and return. Diesel storage requirement for minimum 72 hours should be maintained	
11.	<b>Battery</b>	Dry uncharged maintenance free batteries with leads and terminals	
12.	<b>Management</b>	The DG set should be manageable via Building Management System/ NOC with MODBUS Protocol with RS 485 Communication Port so that all software features like Diesel Consumption, Power,	

S. No.	Parameter/ requirement	Minimum Specifications/requirements	Compliance (Yes / No)
		and Current etc. can be monitored on the BMS screen	

### 3.2. Online UPS 30 KVA and 20 KVA

S. No.	Parameter/ requirement	Minimum Specifications/requirements	Compliance (Yes / No)
1.	UPS Load distribution	UPS A- 30 KVA for Server Racks and Video Wall UPS B- 20 KVA for IT equipment (Workstations/ PCs,) and Lights, one TV, printer and IP Phones	
2.	Input Range	Input Standard Voltage, 380 /400 / 415 V 3 Phase, 3 or 4 wire, +10 %, -15%	
3.	Output Voltage & Waveform	Input Frequency, 50 Hz, +5% or -5%	
		Output Steady State Voltage, 380 / 400 / 415 V +1% or -1%	
4.	Battery Backup	UPS A- 60 mins on each UPS UPS B- 30 mins on each UPS	
5.	Output Frequency	Output Frequency, 50 Hz, +0.25Hz to 0.5Hz	
6.	Voltage	Output Transient Voltage Stability, < 5% or –5% for a load change from 0% to 100%	
7.	Voltage	Overload – 125% for 10 minutes and 150% for 60 seconds	
8.	Efficiency	Efficiency at full rated load, Not less than 92%	
9.	Harmonic	Total Harmonic Content – With Linear Load < 2% for 100 % linear load and with 3:1 Crest factor load < 5%	
10.	Harmonic	Input Harmonic Filter (for <10% Input current distortion)	
11.	DC ripple	DC ripple (with & without Battery connected) < 1%	
12.	General	Built In power factor correction	
13.	General	Automatic shutdown of component for longer power outages	
14.	General	Monitoring and logging the status of the power supply	
15.	General	Displaying the voltage/current draw of the component	
16.	General	Automatic restarting of component following a power outage	
17.	General	Displaying the current voltage on the line	
18.	General	Providing alarms on some error connections	
19.	General	Providing protection against short circuits	

S. No.	Parameter/ requirement	Minimum Specifications/requirements	Compliance (Yes / No)
20.	<b>Temperature Range</b>	Operating Temperature range - 0 to 50 Celsius	
21.	<b>Design</b>	Design compliance with IEC and ISO	
22.	<b>Design</b>	Software that must be installed and integrated suitable operating system	
23.	<b>Design</b>	Supplies True Online UPS Power	
24.	<b>Design</b>	Non-Linear load compatible	
25.	<b>Design</b>	Capability to handle high Crest Factor load	
26.	<b>Design</b>	Ventilation- Air cooling with Integral Fans	
27.	<b>Design</b>	Built in Reliability & High Efficiency	
28.	<b>Design</b>	Low Audible Noise	
29.	<b>Design</b>	Compact Footprint	
30.	<b>Design</b>	Front Access for easy Maintenance	
31.	<b>Design</b>	The power factor of the UPS system shall be at 0.85 or above at all load conditions	
32.	<b>Design</b>	Input Current Harmonics < 10%	
33.	<b>Design</b>	The battery circuit breaker MCCB shall have O/L and U/V protection.	
34.	<b>Design</b>	The UPS shall have built in isolation transformer for re-referencing and to limit neutral- ground voltage to 1.50 volts by directly connecting dedicated earth to neutral of the output isolation transformer of the UPS as stipulated by server manufactures	

### 3.3. Rodent Repellent System

S. No.	Parameter/ requirement	Minimum Specifications/requirements	Compliance (Yes / No)
1.	<b>Design</b>	The entry of Rodents and other unwanted pests shall be controlled using non-chemical, non-toxic devices. Ultrasonic pest repellents shall be provided in the false flooring and ceiling to repel the pests without killing them. However, periodic pest control using Chemical spray can be done once in 3 months as a contingency measure to effectively fight the pest menace.	
2.	<b>Configuration</b>	Master console with necessary transducer	
3.	<b>Operating Frequency</b>	Above 20 KHz (Variable)	

S. No.	Parameter/requirement	Minimum Specifications/requirements	Compliance (Yes / No)
4.	<b>Sound Output</b>	50 dB to 110 dB (at 1 meter)	
5.	<b>Power output</b>	800 mW per transducer	
6.	<b>Power consumption</b>	15 W approximately	
7.	<b>Power Supply</b>	230 V AC 50 Hz	
8.	<b>Mounting</b>	Wall / Table Mounting	

### 3.4. Water Leakage Detection System

S. No.	Parameter/requirement	Minimum Specifications/requirements	Compliance(Yes / No)
1.	<b>General</b>	The water leak detector shall be installed to detect any seepage of water into the critical area and alert the Security Control Room for such leakage. It shall consist of water leak detection cable and an alarm module. The cable shall be installed in the ceiling & floor areas around the periphery.	
2.	<b>Design</b>	Water Leak Detection system should be for the Server and Network room Areas to detect and water flooding below the floor of the DC.	
		Water Leak Detection System should be wire based solution with alarm; the wire needs to lay in DC surrounding the PAC units, which is the probable source of water leakage.	

### 3.5. Building Management System

S. No.	Parameter/requirement	Minimum Specifications/requirements	Compliance (Yes / No)
1.	<b>General</b>	Solution for BMS: Solution should provide an appliance based pre-integrated, centralized and consolidated platform for end to end management of a building, which includes Facility infrastructure (HVACs, LT Panel- AMF, DG, UPS, Fuel Tank, CCTV, Fire Alarm and suppression system) along with IT infrastructure (network, server, application and database). The system should have the service dependency engine that allows to take intelligent decisions, as per the requirements. The tool should have the service-oriented architecture layer and the mediation layer in a single plane. BMS should be open for third party integration via (soap, xml, web service, snmp-v1, v2, v3), NO/NC ports (IO ports) and Modbus	



S. No.	Parameter/requirement	Minimum Specifications/requirements	Compliance (Yes / No)
		(TCP/IP&RTU) integration should be standard. For other industrial protocols, gateway integration should be available. The solution should perform the following general functions. But should be scalable with ready device certifications to accommodate new infrastructure getting added to the building	
2.	<b>Visibility</b>	It should get a single platform to manage the entire building and its components along with the integration with IT infrastructure. The way ahead should be drilling down to the component, which is under performing / about to fail or has failed. The impact of the failed equipment on others should get highlighted. We should get a Hawkeye view to know, how are all the building components working at any point of time. So that issues are addressed as quickly as possible.	
3.	<b>Capacity</b>	End equipment's in the building, should be set with thresholds to get an idea of how well they are rendering services to the people in the building. It should be able to proactively Identify potential area's which may need to be upgraded/downgraded (cooling, power, storage, etc.) with time. All vendor (end equipment vendors) SLA's and their respective maintenance contracts would be part of the OMS (operations and maintenance) plan.	
4.	<b>General</b>	Third Party Integration - for seamless data sharing to build a "Collaborative Decision-Making System".	
5.	<b>Salient Dependencies</b>	Monitor & Control salient interdependencies between safety and security systems like: In case of fire, other than a fire alarm, we could get confirmatory information from the zonal camera. Multiple current surges in any particular zone should lead to an inspection of the electrical cables in the zone. Any sectional power failure should help us to find the failure of the end equipment, by tracing down the LT panel SLD to the end equipment.	
6.	<b>System with CMDB</b>	Integrate people, process & technology. Decreasing the likelihood of downtime in the building by facilitating communication across all equipment's (part of the facility). A definite inventory management tool with a workflow system connecting responsible people, should be part of the solution.	
7.	<b>Root-Cause Analysis</b>	Isolate and pinpoint problem area before it impacts the building operations & business continuity while suppressing down the unwanted events.	
8.	<b>General</b>	Energy sources should always keep in check on the rated power consumption vs the power available for consumption. Since one of the big reasons for fire is higher load than the power distribution capability.	

S. No.	Parameter/requirement	Minimum Specifications/requirements	Compliance (Yes / No)
9.	<b>General</b>	The solution should be capable to store the raw data or as-polled data, for minimum of 365 days. It should also have the facility to automate the backup process or allow us to take manual backup, in case required.	
10.	<b>General</b>	The system should be capable of getting supported by the administrators at different levels. The system should provide individual and group rights and privileges. Normal users may have read access only, that too only to specific areas.	
11.	<b>General</b>	Support for email and SMS both (integration with SMS-gateway and GSM communication).	
12.	<b>Energy Management</b>	The system should be capable of integrating with the mains (LT panel), DG, UPS, PDU, rectifier, energy meters for continuous monitoring of its health. The battery health of the UPS would also be needed.	
13.	<b>Energy Management</b>	System should be able to do continuously monitor the quality of power, supplied to the electricity board and by the Generators (PF, frequency, harmonics distortion etc.), in order to avoid downtime.	
14.	<b>Energy Management</b>	System should have the feature to setup thresholds on each of the monitored energy parameter.	
15.	<b>Energy Management</b>	System should be able to clearly provide load trend for each rack, if need be in the building which would enable setup practical thresholds to get alerted on overload situations, in order to avoid any breakdown.	
16.	<b>Fire Alarm System</b>	The solution should proactively alert in case there is a possibility of an electrical fire (short circuit or over current)	
17.	<b>Fire Alarm System</b>	The solution should have the capability to integrate with different makes of fire alarm panels in the DCs and provide the alarms generated by the system on the centralized dashboard.	
18.	<b>Fire Alarm System</b>	The solution should be able to process a proper evacuation plan in-case of fire using the in-build rules engine.	
19.	<b>Fire Alarm System</b>	Trigger Audio and Visual alarm	
20.	<b>Fire Alarm System</b>	Co-relate with the nearest camera in the site with the FAS zone.	
21.	<b>DG Monitoring &amp; Fuel Automation</b>	Proposed system should be able to integrate with diesel generators for measuring fuel level and run hours of the DG. System should also allow monitoring of various alarms (like: LLOP, dg on, etc.) including quality of power of the DG.	
22.	<b>DG Monitoring &amp; Fuel Automation</b>	System should be capable to do fuel level monitoring of the diesel tanks installed for the gen-sets in the DC'	

S. No.	Parameter/requirement	Minimum Specifications/requirements	Compliance (Yes / No)
		building, in order to have a proactive estimation of fuel availability.	
23.	<b>DG Monitoring &amp; Fuel Automation</b>	Mains Fail DG On DG Failed to start DG Failed to stop DG Fuel Level Low High Water Temperature High Coolant Temperature Low Battery Voltage Low Lube Oil Pressure (LLOP)	
24.	<b>Centralized Reporting &amp; Dashboard</b>	The dashboard and reporting engine should provide centralized view for the entire infrastructure (physical security, safety & energy) and IT infrastructure (network, server, application and database) in the building.	
25.	<b>Centralized Reporting &amp; Dashboard</b>	It should provide business users with highly interactive and power-users with highly sophisticated, pixel-perfect reports.	
26.	<b>Centralized Reporting &amp; Dashboard</b>	It should provide Web-based interactive reporting for business users, Rich graphical report designer for power users, Parameterized reports with powerful charting, Output in popular formats: HTML, CSV, PDF, and ASCII.	
27.	<b>Centralized Reporting &amp; Dashboard</b>	It should provide Analysis to explore data by multiple dimensions such as customer, product, network and time into the hands of business users.	
28.	<b>Centralized Reporting &amp; Dashboard</b>	It should provide intuitive & rich graphic designer to create customized reports.	
29.	<b>Centralized Reporting &amp; Dashboard</b>	Solution should provide a comprehensive centralized dashboard for health monitoring of Infrastructure components like: Electrical Panels, HVAC, UPS, and DG, Fuel etc. along with network, server, application and database.	

## 4. City Helpdesk Hardware

### 4.1. IP Phone

S. No.	Parameter/requirement	Minimum Specifications/requirements	Compliance (Yes / No)
1.	<b>Display</b>	2 line or more, Monochrome display for viewing features like messages, directory	

S. No.	Parameter/ requirement	Minimum Specifications/requirements	Compliance (Yes / No)
2.	<b>Integral switch</b>	10/100 Mbps for a direct connection to a 10/100BASE-T Ethernet network through an RJ-45 interface	
3.	<b>Speaker Phone</b>	Yes	
4.	<b>Headset</b>	Wired, Cushion Padded Dual Ear- Speaker, Noise Cancelling headset with mouthpiece microphone, port compatibility with IP Phone	
5.	<b>VoIP Protocol</b>	SIP V2/H.323	
6.	<b>POE</b>	IEEE 802.3af or better and AC Power Adapter (Option)	
7.	<b>Supported Protocols</b>	SNMP/ TR-069, DHCP, DNS	
8.	<b>Codecs</b>	G.711, G.722, G.729 including handset and speakerphone	
9.	<b>Speaker Phone</b>	Full duplex speaker phone with echo cancellation Speaker on/off button, microphone mute	
10.	<b>Volume control</b>	Easy decibel level adjustment for speaker phone, handset and ringer	
11.	<b>Phonebook/ Address book</b>	Minimum 100 contacts	
12.	<b>Call Logs</b>	Access to missed, received, and placed calls. (Minimum 20 overall)	
13.	<b>Clock</b>	Time and Date on display	
14.	<b>Ringer</b>	Selectable Ringer tone	
15.	<b>Directory Access</b>	LDAP standard directory	

#### 4.2. IP PBX and Voice Router

S. No.	Parameter/ requirement	Minimum Specifications/requirements	Compliance (Yes / No)
1.	<b>General</b>	The IP telephony system should be a converged communication System with ability to run analog and IP on the same platform using same software load based on server and Gateway architecture	
2.	<b>Scalability</b>	The single IP PBX system should be scalable to support up to 500 stations (any mix/percentage of Analog/IP) to achieve the future capacity	
3.	<b>General</b>	The system should be based on server gateway architecture with external server running on Linux OS. No card-based processor systems should be quoted	
4.	<b>Architecture</b>	The voice network architecture and call control functionality should be based on SIP/H.323	

S. No.	Parameter/ requirement	Minimum Specifications/requirements	Compliance (Yes / No)
5.	<b>Redundancy</b>	The call control and system management should support redundancy with no single point of failure	
6.	<b>IP Support</b>	The communication server and gateway should support IP V6 from day one so as to be future proof	
7.	<b>General</b>	The entire solution (IP PBX, its hardware, IP Phones, Voice Gateway) should be from a single OEM	
8.	<b>General</b>	Support for call-processing and call-control	
9.	<b>Protocols</b>	Should support signaling standards/Protocols– SIP, H.323, Q. Sig	
10.	<b>Codecs</b>	Voice Codec support - G.711, G.729, G.729ab, g.722	
11.	<b>GUI</b>	The System should have GUI support web-based management console	
12.	<b>Security</b>	The protection of signaling connections over IP by means of authentication, Integrity and encryption should be carried out using TLS	
13.	<b>Security</b>	System should support MLPP feature	
14.	<b>Security</b>	Proposed system should support SRTP for media encryption and signaling encryption by TLS	
15.	<b>Security</b>	Secure HTTP support for Call Server Administration, Serviceability, User Pages, and Call Detail Record Analysis and Reporting Tool. Should support Secure Sockets Layer (SSL) for directory	
16.	<b>Security</b>	The administrator logging on to the call control server needs to authenticate by suitable mechanism such as User Login Information and Passwords/ Radius Server	
17.	<b>General</b>	Voice gateway to be provided with 1 PRI card with 2 port scalable to 3 PRI in future for PSTN (PRI) line termination.	

#### 4.3. IVR & ACD

S. No.	Parameter/ requirement	Minimum Specifications/requirements	Compliance( Yes / No)
1.	<b>High Availability</b>	Should support high availability with hot standby server that should provide seamless failover in case of main server failure. There should not be any downtime of Contact Centre in case of single server failure in high availability case	
2.	<b>Routing</b>	Should support skill-based routing and it should be possible to put all the agents in to a single skill group and different skill groups	
3.	<b>Routing</b>	ACD support routing of incoming calls based upon caller input to menus, real-time queue statistics, time of day, day of week, ANI, dialled number etc.	

S. No.	Parameter/requirement	Minimum Specifications/requirements	Compliance( Yes / No)
4.	<b>Routing</b>	ACD should support call routing based on longest available agent / circular agent selection algorithms.	
5.	<b>Queuing</b>	ACD should support the playing of customizable queuing announcements based upon the skill group that the call is being queued to, including announcements related to position in queue/ expected delay.	
6.	<b>Chat</b>	Agents should be able to chat with other Agents or supervisor and solution shall be provided with minimum 10 Agent licenses	
7.	<b>Status</b>	Supervisor should be able to see the real-time status of agents; supervisors should be able to make agent ready or logout from the supervisor desktop	
8.	<b>Queuing</b>	Should support Queuing of calls and playing different prompts depending on the type of call and time in the queue.	
9.	<b>Active/Standby Mode</b>	In future if required, the solution should support active and standby server mode, where the server can be put in DC and DR. The solution should support placing of Main and Stand by server in DC and DR respectively.	
10.	<b>DTMF</b>	IVR should play welcome messages to callers Prompts to press and collect DTMF digits	
11.	<b>GUI</b>	GUI based tool to be provided for designing the IVR and ACD call flow.	
12.	<b>Call Flows</b>	IVR should support Voice XML for ASR / TTS, and DTMF call flows	
13.	<b>Read Capability</b>	IVR should be able to Read data from HTTP and XML Pages	
14.	<b>Campaigns</b>	IVR should be able to run outbound campaigns.	
15.	<b>Performance Analysis</b>	System to provide report of IVR Application Performance Analysis, Call by Call details for all the calls, Traffic analysis reports etc.	
16.	<b>Performance Analysis</b>	Reporting platform to support Agent level reports, Agent login, logout report, report on agent state changes	
17.	<b>Performance Analysis</b>	Reporting platform to support custom reports using COTS based reporting tools.	
18.	<b>Performance Analysis</b>	Sort and filter reports send scheduled reports to a file or to a printer. Export reports in a variety of formats, including PDF/RTF/XML/CSV.	
19.	<b>Email</b>	Administrator should be able to assign one or more email addresses to a single Queue.	
20.	<b>Email</b>	Email routing support integration with Microsoft Exchange 2003 or Microsoft Exchange e2007 or 2010.	

S. No.	Parameter/requirement	Minimum Specifications/requirements	Compliance(Yes / No)
21.	Email	Agents should be able to automatically resume of e-mail processing on voice disconnect.	
22.	Email	Agent should be able to save email draft response and resume at a later time.	
23.	Email	Agent should be able to re-queue email.	
24.	Email	Supervisor should be able to access real-time reporting for Agent E-Mail by mail volume	

#### 4.4. Desktop – ICCC

S. No.	Parameter/requirement	Minimum Specifications/requirements	Compliance(Yes / No)
1.	Processor	Minimum Intel Core i7 processor @ 3.5 GHz	
2.	RAM	32 GB	
3.	Internal storage	1 TB SATA 3.0Gb/s	
4.	Graphics	NVIDIA <sup>®</sup> GeForce <sup>®</sup> GTX 1060 or equivalent	
5.	Display	3 Nos 24" LED screen Full HD with maximum 5 ms response time	
6.	Port	<ul style="list-style-type: none"> <li>• 1 HDMI port</li> <li>• 1 VGA port</li> <li>• Minimum 4 Nos USB ports (at least 2 X USB 3.0 ports)</li> <li>• 3.5mm audio jacks</li> <li>• Network interface 2x10/100/1000</li> </ul>	
7.	Keyboard & Mouse	USB based (English + Punjabi keyboard and Optical Scroll Mouse)	
8.	Operating System	Pre-installed operating system (shall support Windows, Linux etc.)	

#### 4.5. Desktop Others

S. No.	Parameter/requirement	Minimum Specifications/requirements	Compliance(Yes / No)
1.	Processor	Intel Core i7, 64bit x86 Processor @ 3.2 GHz or more, 4MB L3 cache, Memory support DDR3 or better specifications	
2.	Memory	8GB DDR III or higher expandable up to 16 GB or more	
3.	Internal storage	1 TB SATA 3.0Gb/s	
4.	Graphics	Integrated Graphic controller	
5.	Display	21" LED touch screen monitor minimum 1920 X 1080 resolution with maximum 5 ms response time or better specifications	
6.	Ports	<ul style="list-style-type: none"> <li>• 1 HDMI port</li> </ul>	



S. No.	Parameter/ requirement	Minimum Specifications/requirements	Compliance (Yes / No)
		<ul style="list-style-type: none"> <li>1 VGA port</li> <li>Minimum 4 Nos USB ports (at least 2 X USB 3.0 ports)</li> <li>3.5mm audio jacks</li> <li>Network interface 2X10/100/1000</li> </ul>	
7.	<b>Keyboard &amp; mouse</b>	USB based (English + Punjabi keyboard and Optical Scroll Mouse)	
8.	<b>Operating System</b>	Pre-installed operating system (shall support Windows, Linux etc.)	
9.	<b>Optical Drive</b>	8X DVD Writer or above	

#### 4.6. Projector

S. No.	Parameter/ requirement	Minimum Specifications/requirements	Compliance (Yes / No)
1.	<b>General</b>	3D Capable: Yes	
2.	<b>General</b>	Analog Video Signal: RGB, component video	
3.	<b>General</b>	Brightness:4000 lumens	
4.	<b>General</b>	Colour Support:1.07 billion colours	
5.	<b>General</b>	Contrast Ratio: 2200:1 / 10000:1 (dynamic)	
6.	<b>General</b>	Device Type: Projector with High Definition 720p or better display	
7.	<b>General</b>	Features:2x colour wheel	
8.	<b>General</b>	Interfaces:1 X VGA input - 15 pin HD D-Sub (HD-15)	
9.	<b>General</b>	Lamp Life Cycle: Up to 3000 hour(s) / up to 5000 hour(s) (economic mode)	
10.	<b>General</b>	Lamp Type:260 Watt	
11.	<b>General</b>	Lens Aperture: F/2.4-2.66	
12.	<b>General</b>	Min Operating Temperature:41 °F	
13.	<b>General</b>	Max Operating Temperature:104 °F	
14.	<b>Projector</b>	Native Aspect Ratio:0.67361	
15.	<b>Projector</b>	Output Power / Channel:10 Watt	
16.	<b>Projector</b>	Power: AC 230 V (50 Hz)	
17.	<b>Projector</b>	Projection Distance: 4 feet. - 33 feet.	
18.	<b>Lens</b>	Resolution: WXGA (1280 X 800)	
19.	<b>Lens</b>	Security Features: Security lock slot	
20.	<b>Lens</b>	Sound Emission:37 dB	
21.	<b>Video Input</b>	Sound Emission (Economic Mode):32 dB	
22.	<b>Video Input</b>	Sound Output Mode: Mono	
23.	<b>Video Input</b>	Speakers: Speaker(s) – integrated	
24.	<b>Speakers</b>	Speakers:1 X mixed channel	
25.	<b>Speakers</b>	Throw Ratio:1.28 - 1.536:1	
26.	<b>Speakers</b>	TV System: PAL-B/G, PAL-N, PAL-M, PAL-I, NTSC 4.43, NTSC 3.58, PAL-D, SECAM L, PAL-H, SECAM K1, SECAM D/K, SECAM B/G	
27.	<b>Speakers</b>	Type: Integrated	



S. No.	Parameter/requirement	Minimum Specifications/requirements	Compliance (Yes / No)
28.	Expansion / Connectivity	Uniformity:0.8	
29.	Miscellaneous	Video Input: RGB, component video (PAL-B/G, PAL-N, PAL-M, PAL-I, NTSC 4.43, NTSC 3.58, PAL-D, SECAM L, PAL-H, SECAM K1, SECAM D/K, SECAM B/G)	
30.	Environmental Parameters	Video Interfaces: VGA, HDMI	
31.	Environmental Parameters	Video Modes:480p, 720p, 1080i, 1080p, 480i, 576i, 576p	
32.	Environmental Parameters	Zoom Factor:1.2x	
33.	Environmental Parameters	Zoom Type: Manual	

#### 4.7. Printer

S. No.	Parameter/requirement	Minimum Specifications/requirements	Compliance (Yes / No)
1.	General	Printers shall be of latest laser technology & for duplex printing (colour and black and white) for all paper size including but not limited to A4, A3 size.	
2.	Technical	It shall have Print Speed 30ppm or above.	
3.	Technical	It shall have Resolution Min 600 X 600 dpi or better.	
4.	Technical	It shall have Memory 1 GB or higher.	
5.	Technical	It shall have Copy speed 12ppm or better.	
6.	General	It shall have scanner of Flat Bed type with ADF.	
7.	Technical	It shall have Interface USB 2.0, Ethernet Port.	
8.	General	It shall have the duty cycle of monthly 5000 pages at minimum.	
9.	General	Full toner Cartridge shall be supplied with the printer.	
10.	General	It shall have input tray capacity of minimum 100 sheets.	
11.	General	It shall have output tray capacity of minimum 100 sheets.	
12.	General	Printer shall be accompanied with the necessary accessories such as connecting cables, driver media, etc.	

#### 4.8. Video Conferencing System

S. No.	Parameter/requirement	Minimum Specifications/requirements	Compliance (Yes / No)
1.	Camera	The VC codec with camera should be PTZ with full HD 1920 x 1080p @60fps with 12x or more optical zoom	
2.	Camera	The camera should be suitable for a large conference room of about 12-15Ft. The camera should have a full HD 1080p codec with 3 x HDMI/DVI-D based	

S. No.	Parameter/ requirement	Minimum Specifications/requirements	Compliance (Yes / No)
3.	<b>Video Input</b>	Video Inputs and 2x HDMI Video outputs, 2 or more microphone inputs ports, 1-line output and touch panel/remote control for operations	
4.	<b>Voice Input</b>	The system should be supplied with minimum 2 Microphones	
5.	<b>Connectivity</b>	The system should work on wi-fi network / wired network	
6.	<b>Connectivity</b>	The system must have the ability to share content both wirelessly and through wired cables	
7.	<b>Video Compression</b>	The system should support latest Audio-Video standards such as H.264, IPV4 and IPV6	
8.	<b>VC Endpoint</b>	The VC Endpoint should seamlessly integrate with cloud-based web conferencing platform	
9.	<b>No. of users</b>	The Web conferencing platform should connect 250 users in a single meeting from room-based VC device, laptop, desktop, android and iOS	
10.	<b>Other</b>	The web conferencing platform should have capability of content sharing, annotation and whiteboarding from laptop, desktop, android and ios devices	

#### 4.9. Enterprise Antivirus software (Client license)

S. No.	Parameter/ requirement	Minimum Specifications/requirements	Compliance (Yes / No)
1.	<b>General</b>	Anti-virus shall have auto update feature, it shall be able to push signature from the centralized server to all the clients or workstations. The solution should have the ability to find whether the endpoint is out of compliance and should accomplish remediation, either via self-contained capabilities or integration with external resources	
2.	<b>General</b>	The solution must support mass mailing virus detection.	
3.	<b>General</b>	The solution must support mail attachment virus detection.	
4.	<b>General</b>	The solution must support Malformed Mail format detection.	
5.	<b>General</b>	Signature-based antivirus should eradicate malware on a system to protect against viruses, worms, Trojans, spyware, bots, adware, and rootkits.	
6.	<b>General</b>	The solution must have its own Updated Recommended Virus Extensions.	
7.	<b>General</b>	The solution must support Heuristics-based mail header detection for Spam.	
8.	<b>General</b>	Solution should have an emulator to cause threats to reveal themselves. This should not be a part of sandboxing and should run individually in each agent	

S. No.	Parameter/ requirement	Minimum Specifications/requirements	Compliance (Yes / No)
9.	General	The solution shall be able to act based on the category in which Spam is detected.	
10.	General	The proposed solution should support endpoint quarantine from network and bring back the endpoint after remediation using ATP management platform	
11.	General	The solution must support Encrypted Mail Detection.	
12.	General	The solution should manage single license for Windows, Linux and ac Operating Systems and management server should not be separate.	
13.	General	The solution must have a Secure SSL Web Management Console.	
14.	General	The solution must be able to prevent System Denial of Service Attack.	
15.	General	Solution should have application control, HIPS, Anti Malware being installed on single server. No separate servers and agents should be required for HIPS or application control	
16.	General	Solution should be able to turn on deception to add bait on the endpoints in your large, distributed environment without any additional agent by creating deceptors like remote connections, credentials, files, network shares, etc, so as soon as an attempt is made, you know you have an attacker	

## 5. Field Components & Sensors

### 5.1. Fire Alarm and Suspension System

The infrastructure solution should be designed as a complete fire detection and fire suppression security systems and should be inter-operable and inter-connected. The environmentally friendly and clean agent, preferably NOVEC 1230 should be used as per NFPA 2001-2012 edition with Petroleum and Safety Explosives Organization (PESO) approved cylinders

#### 5.1.1. Fire Suspension System

S. No.	Parameter/ requirement	Minimum Specifications/requirements	Compliance (Yes / No)
1.	General Specifications	Fire Suppression Systems shall be used to suppress fire in specific hazards or equipment located where an electrically non-conductive agent is required, where agent clean-up creates a problem, where extinguishing capability with low weight is a factor and where personnel normally occupy the hazard	

S. No.	Parameter/ requirement	Minimum Specifications/requirements	Compliance (Yes / No)
2.	<b>Fire Suppression Systems and Classes of Fire</b>	Class A: Surface Type Fires: wood or other cellulose type material Class B: Flammable liquids Class C: Energized electrical equipment For hazards beyond the scope described above, the MSI shall consult with OEM and NFPA 2001	
3.	<b>Codes &amp; Compliance</b>	The design, installation, testing and maintenance of the Fire Suppression Systems, employing NOVEC 1230, shall be in accordance with the following codes, standards and regulatory bodies: NFPA 2001: Standard for Clean Agent Fire Extinguishing Systems UL 2166: Standard for Halocarbon Clean Agent Extinguishing System Units IS: 15493: Gaseous Fire Extinguishing System NFPA 70: National Electrical Code (NEC) NFPA 72: National Fire Alarm Code	
4.	<b>System Design</b>	<ul style="list-style-type: none"> <li>The MSI shall consider and address possible Fire hazards within the protected volume at the bid stage. The delivery of the NOVEC 1230 system shall provide for the highest degree of protection and minimum extinguishing time. The design shall be as per NFPA 2001.</li> <li>Sub floor and the ceiling void to be included in the protected volume. Server farm, UPS room and battery room must be covered under the gas flooding system with single / multiple systems</li> <li>The discharge time required to achieve 95% of the minimum design concentration for flame extinguishment shall not exceed ten (10) seconds. In accordance with NFPA Standard 2001.</li> </ul> <p><b>Flow Calculation Reports</b></p> <ul style="list-style-type: none"> <li>The system flow calculations shall be carried out on certified software, suitable for the particular seamless cylinder container being offered for this project.</li> <li>Fire Suppression Systems shall include the following components:</li> <li>Pipe and Pipe Fittings; Distribution piping, and fittings, shall be installed in accordance with NFPA 2001, approved piping standards and the engineered fire suppression system manufacturer's requirements.</li> </ul> <p>Pipe: As per ASTM A-106, Sch 40, M. S. Seamless</p>	

S. No.	Parameter/ requirement	Minimum Specifications/requirements	Compliance (Yes / No)
5.	<b>System Hardware</b>	<ul style="list-style-type: none"> <li>• Distribution Nozzles: Discharge nozzles shall be used to disperse the agent. The nozzles shall be made of brass with female NPT threads and available in ½” through 2” sizes. Each size shall come in two styles: 180 degree and 360-degree dispersion patterns.</li> <li>• Seamless Cylinders and valve assemblies: The agent shall be stored in seamless type Cylinders. Welded cylinders are not permitted. Agent cylinder operating pressure shall be at 360 PSIG @ 70°F (24.8 bar gauge @ 21°C). Offer Cylinder shall be manufactured and tested in accordance with IS 7285 Standard and approved by PESO for their use. Clean Agent storage cylinders shall be equipped with safety rupture disc and pressure gauge to display internal pressures. The gauge shall be an integral part of the equipment and shall be color-coded for fast referencing of pressure readings.</li> </ul>	
6.	<b>System Hardware</b>	<ul style="list-style-type: none"> <li>• Pressure Control Operated Head: Pressure operated Control Head, should allow for Pressure actuation of Clean. Agent storage Cylinders. This should be mounted directly on top of the master or slave cylinder valve.</li> <li>• Master Cylinder Adapter Kit: The Master Cylinder Adapter Kit, should provide a means to connect the flexible actuation hose to the master &amp; slave cylinder valve assemblies.</li> <li>• Flexible Discharge Hose &amp; Actuation Hose: Flexible Discharge Hose should route clean agent from the storage cylinders to the discharge piping. This hose should be connected to the discharge outlet of the Clean Agent Cylinder Valve. The Flexible Actuation Hose, should be usually used in multiple Cylinder Systems</li> <li>• Manifold Check Valve: Manifold check valves should be installed at the discharge manifold in a multiple cylinder arrangement to allow</li> </ul>	

S. No.	Parameter/ requirement	Minimum Specifications/requirements	Compliance (Yes / No)
		<p>removal of any clean agent cylinder from the manifold while still retaining a closed System</p> <ul style="list-style-type: none"> <li>Manifold Supervisory Switch: Manifold Supervisory Switch, should operate from system pressure upon discharge of gas discharge through piping network</li> </ul>	

### 5.1.2. Fire Alarm System

S. No.	Parameters/ Requirements	Minimum Specifications/Requirements	Compliance Yes/No
1.	<b>Addressable Fire Alarm System</b>	<p>a) The system should be continuously available (fail-safe) and therefore the system should have microprocessor-based Electronics in other modules like relays, loop card, etc.</p> <p>b) Zones/ individuals detectors in the same loop shall be able to be set at different sensing levels and shall possible to be changed through programming at any time</p> <p>c) The system should have exact identification of location and nature/ type of fire incidence/ circuit fault/ emergency (the manual call point) to enable quick response to the incidence (fire or fault)</p> <p>d) The system should continue to be active against any fault / fire incidence at any device; the particular device/detector should only isolate itself so that the balance circuit/surveillance remains available. Therefore, the System components (detector, MCP, sounder, duct detector etc.) should have built-in short-circuit isolator.</p> <p>e) As per EN/ UL standard specifications, the backup battery power should be for 72 hours at least. The batteries should be housed inside/ outside the FACP.</p> <p>f) Modular addition facility shall be available in the Fire Alarm Panel for future additions of loops and devices</p>	
2.	<b>Technical Features</b>	The available electrical power is 220 VAC (+/-10%) and 50 Hz (±3%)	
		Uninterrupted Power Supply (UPS): The FAS shall operate on internally placed and fully captive 24 VDC (nominal) SMF batteries with inbuilt charger for atleast 72 hours in normal conditions and 120 minutes in alarm condition in case of failure of	

S. No.	Parameters/ Requirements	Minimum Specifications/Requirements	Compliance Yes/No
		mains power	
		All system components like detectors, manual call points, sounders shall have corrosion resistant contact points. Termination of SLC cable at devices & panel shall be properly sealed to avoid false alarms due to spurious signal pick up.	
		The entire FAS shall be intelligent analogue addressable type. The system components shall have soft addressing or equivalent.	
		The FAS shall operate on 2 wires (or a 2-core cable) with single loop	
3.		The multi-criteria detectors shall have an electronics free common base of 4" (100 mm) nominal diameter	
		The multi-criteria detectors and manual call points shall have inbuilt fault isolators. The multi-criteria detectors shall have a plug-in wiring connector for ease of installation and serviceability. Easy wiring using terminal block shall be provided to enable removal of a detector without loss of power to the remaining loop	
		The multi-criteria detectors shall have an inbuilt function test switch, which initiates local visual alarm signal through LED but neither the fire alarm is annunciated, nor any actions initiated on this signal. OR Panel should have "maintenance" mode to test for alarm signal, where output is not activated	
		The detectors should have a facility of automatic drift compensation and they should adjust to the environmental changes	
		All the components and devices of FAS of the Fire Alarm Control Panel (FACP) should work on power drawn from FACP. External powering should allow in case of supply of Sounder cum Strobe	
		The environmental conditions are 10%-95% RH and 0-40 degree C ambient temperature	
		The Fire Alarm Control Panel shall be compatible with RS 485	

### 5.1.3. FACP

S. No.	Parameters/Requirements	Minimum Specification Requirements	Compliance Yes/No
1.	<b>Intelligent Feature</b>	Single/ Dual CPU	
2.	<b>Number of Loops</b>	1 loop expandable to 5 loops	
3.	<b>Capacity</b>	Min. 150 detectors & devices per loop	
4.	<b>Authentication</b>	Two level password protection	
5.	<b>No. of users</b>	3 user level passwords	
6.	<b>Programmability</b>	Through Panel /PC	
7.	<b>Display</b>	5.7" TFT color plain text display	
8.	<b>Sounder</b>	Inbuilt/ External different tones for fire & fault	
9.	<b>Event Logging</b>	1000 events	
10.	<b>Messaging</b>	Automatic SMS to 5 mobile numbers	
11.	<b>Dialing</b>	Automatic dialing to 3 telephone numbers for giving pre-recorded messages of 60 seconds duration. Prerecording on non-volatile memory	
12.	<b>Connectivity</b>	RS 485	

### 5.1.4. Multi-criteria Detector

S. No.	Parameters/Requirements	Minimum Specification Requirements	Compliance Yes/No
1.	<b>Detection</b>	Smoke, temperature, rate of rise	
2.	<b>Optical detection</b>	Light Scatter Principle	
3.	<b>Light Emission</b>	Photoelectric / high power LED	
4.	<b>Heat Detection Circuit</b>	NTC sensors	
6.	<b>Sensitivity Adjustability</b>	Through FACP	
7.	<b>Controls with FACP</b>	The detector shall be able to read its settings from the control panel. Latching the detector and isolating the detector from the FACP shall be possible	
8.	<b>Construction</b>	Polycarbonate Plastic	
9.	<b>Output</b>	Local and FACP	
10.	<b>Maintainability</b>	Build-up of dirt or similar contamination on the sensing chamber shall be continually monitored by control panel, when it exceeds predetermined level; the panel should indicate that the detector is in need of servicing. The type of fault should be available on the	



S. No.	Parameters/Requirements	Minimum Specification Requirements	Compliance Yes/No
		computer or on the panel. The detector sensing chamber shall be easily removable for cleaning and maintenance purpose	

### 5.1.5. MCP

S. No.	Parameters/Requirements	Minimum Specification Requirements	Compliance Yes/No
1.	Intelligent Feature	Integral Microprocessor	
2.	Type	Press Glass, double action	
3.	Cover	Transparent protective flip cover in unbreakable type polycarbonate	
4.	Reset	Directly from panel	
5.	Color	Red	
6.	Powering	By FACP	

### 5.2. Variable Messaging Display

S. No.	Parameter/ requirement	Minimum Specifications/requirements	Compliance (Yes / No)
1.	<b>Dimensions</b>	3.0 mtr. length X 1.8 mtr. height X 0.2 mtr. depth. (3000mm x 1800mm X 200mm)	
2.	<b>Colour LED</b>	Full Colour, class designation C2 as per IRC/EN 12966 standard	
3.	<b>Luminance Class/Ratio</b>	L3 as per IRC/EN 12966 standards	
4.	<b>Luminance Control &amp; auto Diming</b>	A. Should be automatically provide different luminance levels but shall also be controllable from the traffic centre using software. B. Auto dimming capability to adjust to ambient light level (sensor based automatic control). C. Photoelectric sensor shall be positioned at the sign front and sign rear to measure ambient light. Capable of being continually exposed to direct sunlight without impairment of performance.	
5.	<b>Contrast Ratio</b>	R3 as per IRC/EN 12966 standard	
6.	<b>Beam Width</b>	B6+ as per IRC/EN12966 standards	
7.	<b>Pixel Pitch</b>	6mm or better	

S. No.	Parameter/ requirement	Minimum Specifications/requirements	Compliance
			(Yes / No)
8.	<b>Picture Display</b>	A. At least 300mm as per IRC /EN 12966 standards. B. Full Matrix: Number of lines & characters adjustable, active area: 2.88mX1.2m at least. C. Synchronized Dot to Dot display. D. Capable of displaying real time, customized messages generated by JICCC. E. Special frontal design to avoid reflection. F. Display shall be UV resistant	
9.	<b>Viewing Angle</b>	B6+ as per IRC/EN12966 standard- Viewing angle shall ensure message readability for motorists in all lanes of the approach road	
10.	<b>Viewing Distance</b>	Suitable for readability from 150 Mtrs. or more at the character size of 240mm, from moving vehicles.	
11.	<b>Self-Test</b>	A. VMS shall have self-test diagnostic feature to test for correct operation. B. Display driver boards shall test the status of all display cells in the sign even when diodes are not illuminated. C. All periodic self-test results shall be relayed to the JICCC in real time to update status of VaMS	
12.	<b>Alarms</b>	A. Door Open sensor to Inform Control room during unauthorized access. B. LED Pixel failure detection alarm	
13.	<b>Flicker</b>	Refresh Frequency should not be less 90 Hz. No visible flicker to naked eye.	
14.	<b>Multiple Data Communication interface/Ports</b>	RJ45 Ethernet/ RS232, RS 485, FC port and any other suitable	
15.	<b>Communication (connectivity)</b>	Wired/GPRS based wireless technology with 3G upgradable to 4G capability.	

S. No.	Parameter/ requirement	Minimum Specifications/requirements	Compliance
			(Yes / No)
16.	<b>Ambient Operating Temperature</b>	The system should be capable of working in ambient temperature range of -10 degrees to 60 degrees.	
17.	<b>Humidity (RH)</b>	Operating ambient humidity: 20% - 90% Rh or better.	
18.	<b>Protection against Pollution/dust/water</b>	Complete VMS should be of IP 65 protection level from front and IP54 from side and rear. As per EN60529 or equivalent Standard	
19.	<b>Power</b>	A. 170-250V AC (more than 90% power factor) or DC as per equipment requirement. B. Protection for overvoltage/ fluctuation/drop of the nominal voltage (50%) shall be incorporated. C. The enclosure shall contain at least two 15 Amp VAC (industrial grade) outlet socket for maintenance purpose.	
20	<b>Power Back-up &amp; its enclosure</b>	UPS for 15 Mins power back-up with auto switching facility. The enclosure of UPS and battery should be pole mountable with IP 65 protected housing and lockable. Batteries with solar charging options can also be recommended as back up	
21	<b>Material for VaMS frame</b>	at least 2mm aluminium or non-corrosive, water resistant or better	
22	<b>Mounting, Installation and finishes</b>	A. Mounting structure shall use minimum 6 Mtrs. high hexagonal/octagonal MS Pole or suitable structure with 5.5 mtr. Minimum vertical clearance under the VaMS sign from the Road surface. MSI shall be responsible to carry out the site survey to assess site requirement including pole height/suitable structure for VaMS installation at various places in the city. B. The mounting shall be capable of withstanding roadside vibrations at site of installation. C. It shall be provided with	

S. No.	Parameter/ requirement	Minimum Specifications/requirements	Compliance (Yes / No)
		<p>suitable walkway for maintenance access.</p> <p>D. The sides interior and rear of enclosures shall be provided in maintenance free natural aluminium finish. All enclosure shall be flat and wipe clean.</p> <p>E. Rugged locking mechanism should be provided for the onsite enclosures and cabinets</p> <p>F. For Structural safety, the successful bidder has to provide structural safety certificate from qualified structural engineers approved/ certified by Govt. Agency.</p>	
23	<b>Wind Load</b>	WL9 as per EN12966 to withstand high wind speeds and its own load.	
24	<b>Cabling, connections and Labelling.</b>	<p>A. All cable conductors shall be of ISI marked for quality and safety. It shall be of copper insulated, securely fastened, grouped, wherever possible, using tie warps approximately every 10-20 cms or cable trays.</p> <p>B. All connections shall be vibration-proof quick release connections except for power cables terminating in terminal blocks, which shall be screwed down.</p> <p>C. All terminal block shall be made from self-extinguishing materials. Terminations shall be logically grouped by function and terminals carrying power shall be segregated from control signal terminals.</p> <p>D. All cables shall be clearly labelled with indelible indication that can clearly be identified by maintenance personnel using "As built drawings".</p> <p>E. Lightning arrester shall be installed for safety on each VMS.</p> <p>F. The successful bidder has to provide safety certificate from</p>	

S. No.	Parameter/ requirement	Minimum Specifications/requirements	Compliance (Yes / No)
		qualified Electrical engineers approved/certified by Govt. Agency	
25	Local Storage in VaMS	Embedded VaMS controller should be capable to store at least 100 messages and symbols/pictograms to allow display to run in isolated mode on a predefined structure/ timing, in case of connectivity failure.	
26	Pitch Pixel	Pixel Pitch should be minimum 6 mm or better.	

### 5.3. Field Junction Box

S. No.	Parameter/ requirement	Minimum Specifications/requirements	Compliance (Yes / No)
1.	Size	Suitable size as per site requirements to house the field equipment	
2.	Cabinet Material	Powder coated CRCA sheet/ Stainless steel	
3.	Material Thickness	Min. 1.2mm	
4.	Number of Locks	3-way lock	
5.	Protection	IP 55, Junction Box design should ensure to keep the temperature within suitable operating range for equipment's and should also avoid intentional water splash and dust intake	

S. No.	Parameter/ requirement	Minimum Specifications/requirements	Compliance (Yes / No)
6.	<b>Mounting</b>	On Camera Pole / Ground mounted on concrete base	
7.	<b>Form Factor</b>	Rack Mount/DIN Rail	
8.	<b>Other Features</b>	<ul style="list-style-type: none"> <li>• Rain Canopy, Cable entry with glands and Fans/any other accessories as required for operation of equipment's within junction box</li> <li>• Shall have separate inlet/outlet and lockable doors for:               <ul style="list-style-type: none"> <li>A. Power Cabinet: This cabinet shall be capable of housing electricity meter, online UPS system and the redundant power supply system</li> <li>B. Control cabinet: This cabinet shall house the controllers for all the field components at that particular location e.g. ANPR, PTZ, RLVD, Fixed cameras, etc.</li> </ul> </li> </ul>	

## 5.4. Air quality/Environment Sensor

### 5.4.1. Air Quality Monitoring Station

S. No.	Parameter/ requirement	Minimum specifications/requirements	Compliance (Yes / No)
1.	<b>General</b>	Should be ruggedized enough to be deployed in open air areas, on streets and parks	
2.	<b>General</b>	Should be able to read and report the following parameters: PM 10, PM 2.5, NO2, SO2, CO, O3, CO2,	
3.	<b>Connectivity</b>	Sensors should be able to connect through Fibre, USB, Ethernet, Wi-Fi, 2G, 3G 4G, LTE, LoRA connectivity mediums, whichever was feasible	
4.	<b>Environmental Conditions</b>	Enclosure shall be rugged weather proof IP65 rated and shall house the power modules, thermal management system, embedded PC and user configured analyzer modules as well	
5.	<b>Environmental Conditions</b>	Environmental operating range shall be 0°C to +60°	
6.	<b>General</b>	The design shall be modular in nature which shall have the capability to add additional environmental sensors in the future into the enclosure	
7.	<b>General</b>	Data of all the environmental sensor shall be available on the same software interface	
8.	<b>General</b>	It shall be possible to remove or replace individual sensor modules without affecting the functioning of rest of the system	
9.	<b>General</b>	Mounting of the environmental sensor module shall be co-located on streetlight pole or shall be installed on a tripod stand or a standalone pole	

#### 5.4.2. Carbon Mono Oxide (CO) Sensor

S. No.	Parameter/ requirement	Minimum specifications/requirements	Compliance (Yes / No)
1.	Range	Range of CO sensor shall be between 0 to 1000 PPM	
2.	Resolution	Resolution of CO sensor shall be 0.01 PPM or better	
3.	Lower Detectable Limit	Lower detectable limit of CO sensor shall be 0.040 PPM or better	
4.	Precision	Precision of CO sensor shall be less than 3% of reading or better	
5.	Linearity	Linearity of CO sensor shall be less than 1% of full scale or better	
6.	Response Time	Response time of CO sensor shall be less than 60 seconds	
7.	Operating Temperature	Operating temperature of CO sensor shall be 0°C to 60°C	
8.	Operating Pressure	Operating pressure of CO sensor shall be $\pm 10\%$	

#### 5.4.3. Ozone (O3) Sensor

S. No.	Parameter/ requirement	Minimum specifications/requirements	Compliance (Yes / No)
1.	Range	O3 Sensor shall have a range of at least 0-1000 PPB.	
2.	Resolution	Resolution of O3 sensor shall be 10 PPB or better.	
3.	Lower Detectable Limit	Lower detectable limit of O3 sensor shall be 10 PPB or better.	
4.	Precision	Precision of O3 sensor shall be less than 2% of reading or better.	
5.	Linearity	Linearity of O3 sensor shall be less than 1% of full scale.	
6.	Response Time	Response time of O3 sensor shall be less than 60 seconds.	
7.	Operating Temperature	Operating temperature of O3 sensor shall be 0°C to 60°C.	
8.	Operating Pressure	Operating pressure of O3 sensor shall be $\pm 10\%$ .	

#### 5.4.4. Nitrogen Dioxide (NO2) Sensor

S. No.	Parameter/ requirement	Minimum specifications/requirements	Compliance (Yes / No)
1.	Range	NO2 Sensor shall have a range of at least 0-10 PPM.	
2.	Resolution	Resolution of NO2 sensor shall be 0.001 PPM or better.	
3.	Lower Detectable Limit	Lower detectable limit of NO2 sensor shall be 0.001 PPM or better.	

S. No.	Parameter/requirement	Minimum specifications/requirements	Compliance (Yes / No)
4.	<b>Precision</b>	Precision of NO2 sensor shall be less than 3% of reading or better.	
5.	<b>Linearity</b>	Linearity of NO2 sensor shall be less than 1% of full scale.	
6.	<b>Response Time</b>	Response time of NO2 sensor shall be less than 60 seconds.	
7.	<b>Operating Temperature</b>	Operating temperature of NO2 sensor shall be 0°C to 60°C.	
8.	<b>Operating Pressure</b>	Operating pressure of NO2 sensor shall be $\pm 10\%$ .	

#### 5.4.5. Sulphur Dioxide (SO<sub>2</sub>) Sensor

S. No.	Parameter/requirement	Minimum specifications/requirements	Compliance (Yes / No)
1.	<b>Range</b>	SO2 Sensor shall have a range of at least 0-20 PPM.	
2.	<b>Resolution</b>	Resolution of SO2 sensor shall be 0.001 PPM or better.	
3.	<b>Lower Detectable Limit</b>	Lower detectable limit of SO2 sensor shall be 0.009 PPM or better.	
4.	<b>Precision</b>	Precision of SO2 sensor shall be less than 3% of reading or better.	
5.	<b>Linearity</b>	Linearity of SO2 sensor shall be less than 1% of full scale.	
6.	<b>Response Time</b>	Response time of SO2 sensor shall be less than 60 seconds.	
7.	<b>Operating Temperature</b>	Operating temperature of SO2 sensor shall be 0°C to 60°C.	
8.	<b>Operating Pressure</b>	Operating pressure of SO2 sensor shall be $\pm 10\%$ .	

#### 5.4.6. Carbon Dioxide (CO<sub>2</sub>) Sensor

S. No.	Parameter/requirement	Minimum specifications/requirements	Compliance (Yes / No)
1.	<b>Range</b>	CO2 Sensor shall have a range of at least 0-5000 PPM.	
2.	<b>Resolution</b>	Resolution of CO2 sensor shall be 1 PPM or better.	
3.	<b>Lower Detectable Limit</b>	Lower detectable limit of CO2 sensor shall be 10 PPM or better.	
4.	<b>Precision</b>	Precision of CO2 sensor shall be less than 3% of reading or better.	
5.	<b>Linearity</b>	Linearity of CO2 sensor shall be less than 2% of full scale.	
6.	<b>Response Time</b>	Response time of CO2 sensor shall be less than 60 seconds.	



S. No.	Parameter/ requirement	Minimum specifications/requirements	Compliance (Yes / No)
7.	<b>Operating Temperature</b>	Operating temperature of CO2sensor shall be 0°C to 60°C.	
8.	<b>Operating Pressure</b>	Operating pressure of CO2 sensor shall be ±10%.	

#### 5.4.7. PM10 Sensor

S. No.	Parameter/ requirement	Minimum specifications/requirements	Compliance (Yes / No)
1.	<b>Range</b>	Range of PM10 shall be 0 to 450 micro gms / cu.m or better.	
2.	<b>Lower Detectable Limit</b>	Lower detectable limit of particulate profile sensor shall be less than 1 µg/m <sup>3</sup> .	
3.	<b>Accuracy</b>	Accuracy of particulate profile sensor shall be $\leq \pm (5 \mu\text{g}/\text{m}^3 + 15\% \text{ of reading})$ .	
4.	<b>Flow Rate</b>	Flow rate shall be 1.0 LPM or better.	
5.	<b>Operating Temperature</b>	Operating temperature of the sensor shall be 0°C to 60°C.	
6.	<b>Operating Pressure</b>	Operating pressure of the sensor shall be ±10%.	

#### 5.4.8. PM2.5 Sensor

S. No.	Parameter/ requirement	Minimum specifications/requirements	Compliance (Yes / No)
1.	<b>Range</b>	Range of PM2.5 shall be 0 to 230 micro gm / cu.m or better	
2.	<b>Lower Detectable Limit</b>	Lower detectable limit of particulate profile sensor shall be less than 1 µg/m <sup>3</sup> .	
3.	<b>Accuracy</b>	Accuracy of particulate profile sensor shall be $\leq \pm (5 \mu\text{g}/\text{m}^3 + 15\% \text{ of reading})$ .	
4.	<b>Flow Rate</b>	Flow rate shall be 1.0 LPM or better.	
5.	<b>Operating Temperature</b>	Operating temperature of the sensor shall be 0°C to 60°C.	
6.	<b>Operating Pressure</b>	Operating pressure of the sensor shall be ±10%.	

#### 5.4.9. Noise Sensor

S. No.	Parameter/ requirement	Minimum specifications/requirements	Compliance (Yes / No)
1.	<b>General</b>	Noise sensor shall detect the intensity of the ambient sound in a particular area.	

S. No.	Parameter/ requirement	Minimum specifications/requirements	Compliance (Yes / No)
2.	<b>General</b>	Nosie Sensors shall be installed for the outdoor applications.	
3.	<b>Range</b>	Noise sensor shall be able to identify the areas of high sound intensity ranging from 30 dBA to 120 dBA.	

#### 5.4.10. Air Quality Parameter Display

S. No.	Parameter/ requirement	Minimum specifications/requirements	Compliance (Yes / No)
1.	<b>Size</b>	LED Display - Minimum 600x1000 mm	
2.	<b>Pitch</b>	10 mm (H) X 10 mm (V)	
3.	<b>Colour</b>	Amber coloured LED - Day Light Readable	
4.	<b>Minimum &amp; maximum viewing distance and angle of viewing</b>	Viewing distance 20-100 meters Angle of viewing - Minimum 60°V – 110°H	
5.	<b>Communication protocol</b>	GPRS, RF, RS485 etc. as per site requirement	
6.	<b>Controller and antenna</b>	Inbuilt	
7.	<b>Environmental specifications</b>	(a) Temperature: 0 to +55 deg C (b) Thermal cycling: 5 Deg C/mt (c) Humidity: 5% to 95% RH (d) Sealing: IP 65 (Front), IP 54 (Rear)	
8.	<b>Minimum life</b>	50,000 Hrs	
9.	<b>Data format</b>	Bitmap or Unicode	
10.	<b>Power supply</b>	90 V to 250 V AC; 50 VA	
11.	<b>Update of Information</b>	Real-time (configurable refresh rate)	
12.	<b>Display Format</b>	Multimedia content, text in Hindi, English and Gurmukhi/ with presentation in tables, fixed and scrolling text	
13.	<b>Structure</b>	Light weight structure with toughened glass fixed with UV resistant adhesive in front	
14.	<b>Compliance</b>	IS /IEC 60947-1:2004 in conjunction with IS/IEC 60529:2001	

#### 5.5. Access Control

S. No.	Parameter/ requirement	Minimum Specifications/requirements	Compliance (Yes / No)
1.	<b>Design requirement</b>	The Access Control System shall be deployed with the objective of allowing entry and exit to and from the premises to authorized personnel only. The system deployed shall be based on Proximity as well as Biometric Technology and Password for the	

S. No.	Parameter/requirement	Minimum Specifications/requirements	Compliance (Yes / No)
		critical areas and Proximity technology for non-critical areas	
2.	<b>Design requirement</b>	An access control system consisting of a central PC, intelligent controllers, proximity readers, power supplies, proximity cards and all associated accessories is required to make a fully operational on line access control system. Access control shall be provided for doors	
3.	<b>Design requirement</b>	These doors shall be provided with electric locks, and shall operate on fail-safe principle. The lock shall remain unlocked in the event of a fire alarm or in the event of a power failure. The fire alarm supplier shall make potential free contacts available for releasing the locks in a fire condition especially for staircase and main doors	
4.	<b>Monitoring</b>	The system shall monitor the status of the doors through magnetic reed contacts	
5.	<b>Access Control</b>	Controlled Entries to defined access points	
6.	<b>Access Control</b>	Controlled exits from defined access points	
7.	<b>Access Control</b>	Controlled entries and exits for visitors	
8.	<b>Manageability</b>	Configurable system for user defined access policy for each access point	
9.	<b>Manageability</b>	Record, report and archive each and every activity (permission granted and / or rejected) for each access point.	
10.	<b>Manageability</b>	User defined reporting and log formats	
11.	<b>Manageability</b>	Fail safe operation in case of no-power condition and abnormal condition such as fire, theft, intrusion, loss of access control, etc.	
12.	<b>Manageability</b>	Day, Date, Time and duration-based access rights should be user configurable for each access point and for each user.	
13.	<b>Manageability</b>	One user can have different policy / access rights for different access points	

## 5.6. Public Address System with Integrated Audio Amplifier

S. No.	Parameter/requirement	Minimum Specifications/requirements	Compliance (Yes / No)
1.	<b>General</b>	<ul style="list-style-type: none"> <li>The system should allow streaming in both local network and internet and operable from Central command centre. System should have the capability to control individual PAS i.e. to make an announcement at select location (1:1) and all location (1: many) simultaneously. The PAS should also support both, Live and pre-recorded inputs</li> <li>Unlimited number of both sources and incomers of stream in the system</li> <li>Division of the speakers into independently controlled groups, minimum 2 Speaker, to be used for public address system at a location.</li> <li>Possibility to setup an independent operating</li> <li>Audio playback from a file or an external source</li> <li>Audio streams mixing - playlist creation support</li> </ul>	
2.	<b>Audio</b>	<ul style="list-style-type: none"> <li>One-way/two-way (mono)</li> </ul>	
3.	<b>Compression</b>	G.711 PCM 8 kHz, G.726 ADPCM 8 kHz, WAV, MP3 in mono/stereo from 64 kbps to 320 kbps. Constant and variable bit rate. Sampling rate from 8 kHz up to 48 kHz. Configurable bit rate	
4.	<b>input/output</b>	Built-in microphone with frequency 50 Hz - 16 kHz	
5.	<b>Max sound pressure level</b>	>120 dB	
6.	<b>Frequency response</b>	280 Hz -12.5 kHz	
7.	<b>Coverage</b>	Minimum 70° horizontal by 95° vertical (at 2 kHz)	
8.	<b>Built In Amplifier</b>	Minimum 10 W Class D amplifier	
9.	<b>Security</b>	Password protection, HTTPS encryption, IEEE 802.1X network access control, Digest authentication, User access log	
10.	<b>Supported protocols</b>	Supported protocols: DiffServ, FTP, SMTP, Bonjour / ICMP / SSH, UPnP, SNMP v1/v2c/v3 (MIB-II), DNS, DynDNS, NTP, TCP, UDP, IGMP, DHCP, ARP, SOCKS	
11.	<b>Audio functionality</b>	shall support SIP for integration with VoIP, peer-to-peer or integrated into SIP/PBX	
12.	<b>Installation and Maintenance</b>	The horn speaker shall include a test functionality allowing a test tone sequence to be generated and measured by the built-in microphone to verify full functionality	

S. No.	Parameter/ requirement	Minimum Specifications/requirements	Compliance (Yes / No)
13.	API	Shall be fully supported by an open and published API (Application Programmers Interface), which shall provide necessary information for integration of functionality into third party applications	
14.	Firmware	The firmware upgrade shall be done through web interface, the firmware shall be available free of cost	
15.	Audio Speaker test	Shall be available for testing speaker functionality	
16.	Event triggers	Call, Virtual inputs	
17.	Event actions	<ul style="list-style-type: none"> <li>• File upload via HTTP/network share/ email</li> <li>• Notification via email, HTTP and TCP</li> <li>• Play audio clip</li> <li>• Send Auto Speaker Test</li> <li>• Send SNMP trap</li> <li>• Status LED</li> </ul>	
18.	Built-in installation aids	Test tone	
19.	Functional monitoring	Auto Speaker Test, Connection verification, Built-in system logging	
20.	Housing	Impact-resistant aluminium, IP66 rated	
21.	Built in Memory	Minimum 256 MB RAM, 256 MB Flash	
22.	Power	Power over Ethernet (PoE) IEEE 802.3af/802.3at Type 1 Class 3(max 14 W)	
23.	Connectors	RJ45 10BASE-T/100BASE-TX PoE	
24.	Operating Temperature	0°C to 50 °C	
25.	Operating Humidity	Humidity 10–100% RH (condensing)	
26.	Certification	EN, CE, FCC, UL, IEC	

### 5.7. ICC Facility Public Address System and Common Alarm System

S. No.	Parameter/ requirement	Minimum Specifications/requirements	Compliance (Yes / No)
1.	General	<p>The PA system is required for:</p> <ul style="list-style-type: none"> <li>• Making public announcement from the Security Control Room and Facility Manager's room. Clear and crisp announcement should reach to the entire Facility area.</li> <li>• Microphones should be provided to make announcements / respond to announcement from the designated location within the Facility.</li> <li>• To play light music if required.</li> </ul>	
2.	General	Common Alarm System:	

S. No.	Parameter/ requirement	Minimum Specifications/requirements	Compliance (Yes / No)
		<ul style="list-style-type: none"><li>• The common alarm panel is required for checking the healthiness of all systems, to be installed at Data centre.</li><li>• The panel can be installed in the room of Security Officer at Data centre.</li><li>• The common alarm panel should have provision for accepting “potential free” signals from all system for relevant status change in that system</li></ul>	

## 5.8. Online UPS 1 KVA with 1-hour Battery Back-up

S. No.	Parameter/requirement	Minimum specifications/requirements	Compliance (Yes / No)
1.	Input Voltage Range	160 - 300 V at 100%	
2.	Frequency (default: sync range)	50 HZ	
3.	Protection	Inbuilt Short Circuit, Over/ Under Voltage	
4.	Surge Protection	Class C type (IEC 61643-1, UL 94-0) / Latest Class B type	
5.	Power Factor	> 0.9 at 50% load	
6.	System Total Usable Capacity (AC+DC)	Usable Capacity - 900 W	
7.	Minimum DC Capacity	As per site requirement	
8.	Minimum AC Capacity	As per site requirement	
9.	Nominal System Output Voltage	220V AC/ Sine Wave	
10.	Frequency	50Hz +- 5%	
11.	Overload Protection	Yes	
12.	THD/THDV	<=5% on linear load condition	
13.	Protection	Short Circuit, Over Temperature	
14.	Crest Factor	3:1 (Peak to Average power ration)	
15.	Efficiency	89%, preferably double conversion mode	
16.	Output Ports	As per site requirement	
17.	Controls and Monitoring	Embedded Controller with LCD display	
18.	User interface	<ul style="list-style-type: none"> <li>LEDs for local visual alarming (Major, Minor, Power ON)</li> <li>Ethernet for remote or local monitoring and control via Web browser</li> <li>SNMP V2 &amp; V.3.0 protocol</li> </ul>	
19.	Operating temperature	0 to +45 °C	
20.	Battery Technology	Support VRLA/SMF / Lithium Ion phosphate with Battery Management Technology to protect the battery from overcharge condition	
21.	Remote Management	Monitoring battery alarms, energy consumption, On/Off connected loads and parameters	
22.	Battery Backup	1 hour (60 minutes)	

### 5.9. Online UPS 30 KVA with 1-hour Battery Back-up and 20 KVA with 30 minutes Battery Back-up

S. No.	Parameter/ requirement	Minimum specifications/requirements	Compliance (Yes / No)
1.	UPS Load distribution	UPS A- 30 KVA for Server Racks and Video Wall UPS B- 20 KVA for IT equipment (Workstations/ PCs,) and Lights, one TV, printer and IP Phones	
2.	Input Range	Input Standard Voltage, 380 /400 / 415 V 3 Phase, 3 or 4 wire, +10 %, -15%	
3.	Output Voltage & Waveform	Input Frequency, 50 Hz, +5% or -5%	
		Output Steady State Voltage, 380 / 400 / 415 V +1% or -1%	
4.	Battery Backup	UPS A- 60 mins on each UPS UPS B- 30 mins on each UPS	
5.	Output Frequency	Output Frequency, 50 Hz, +0.25Hz to 0.5Hz	
6.	Voltage	Output Transient Voltage Stability, < 5% or –5% for a load change from 0% to 100%	
7.	Voltage	Overload – 125% for 10 minutes and 150% for 60 seconds	
8.	Efficiency	Efficiency at full rated load, min. 92% or above with latest technology such as IGBT	
9.	Harmonic	Total Harmonic Content – With Linear Load < 2% for 100 % linear load and with 3:1 Crest factor load < 5%	
10.	Harmonic	Input Current Harmonics <=5%	
11.	DC ripple	DC ripple (with & without Battery connected) < 1%	
12.	General	Built In power factor correction	
13.	General	Automatic shutdown of component for longer power outages	
14.	General	Monitoring and logging the status of the power supply	
15.	General	Displaying the voltage/current draw of the component	
16.	General	Automatic restarting of component following a power outage	
17.	General	Displaying the current voltage on the line	
18.	General	Providing alarms on some error connections	
19.	General	Providing protection against short circuits	
20.	Temperature Range	Operating Temperature range - 0 to 45 Celsius	
21.	Design	Design compliance with IEC and ISO	



S. No.	Parameter/requirement	Minimum specifications/requirements	Compliance (Yes / No)
22.	Design	Software that must be installed and integrated suitable operating system	
23.	Design	Supplies True Online UPS Power	
24.	Design	Non-Linear load compatible	
25.	Design	Capability to handle high Crest Factor load	
26.	Design	Ventilation- Air cooling with Integral Fans	
27.	Design	Built in Reliability & High Efficiency	
28.	Design	Low Audible Noise	
29.	Design	Compact Footprint	
30.	Design	Front Access for easy Maintenance	
31.	Design	The power factor of the UPS system shall be at 0.85 or above at all load conditions	
32.	Design	Input Current Harmonics < 10%	
33.	Design	The battery circuit breaker MCCB shall have O/L and U/V protection. Battery Technology - support VRLA/SMF / Lithium Ion phosphate with Battery Management Technology to protect the battery from overcharge condition	
34.	Design	Design the UPS shall have built in isolation transformer at input side with installation externally for by-pass	

## 5.10. ATCS Controller

S. No.	Minimum specifications/requirements	Compliance (Yes / No)
1.	Communication protocol: UTMC/UG405/NTCIP or equivalent	
2.	Number of detector inputs: 4 videos plus 4 pedestrians minimum	
3.	Police Control Panel: Yes, with hurry calls and push to change buttons	
4.	Temperature: 0°C to 60°C	
5.	Interfaces: 1 x 10/100 Ethernet interface; 2 x USB 2.0 host ports; 1 x micro USB 2.0 port; 1 x RS232 port; 1 x RS485 port	
6.	RAM: 128 MB SDRAM minimum	
7.	Storage Capacity: 512 MB minimum	
8.	Timing Resolution: Minimum 100 msec (input resolution to 2ms)	
9.	Output Pins: Minimum 32 Interface pins	
10.	Number of signal groups: 16 min.	
11.	Number of phases: 16 min.	
12.	Number of signal plans: 32 min.	
13.	32-bit Processor	
14.	Shall be possible to run custom traffic control logic	
15.	Shall send the detector data back to the control room ATCS application	