



**Request for Proposal (RFP)**  
**for**  
**Selection of Master System Integrator (MSI) for**  
**Implementation of Integrated Command & Control**  
**Center (ICCC) in Allahabad City**

**Volume 2 – Scope of Work**  
**RFP Number: 35/ASCL-ICCC/18**  
**Date: 14-04-2018**

Invited by:  
Allahabad Smart City Limited (ASCL)  
1, Sarojini Naidu Marg, Civil Lines, Allahabad  
Uttar Pradesh-211001.

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other costs or other expenses incurred by a Bidder in preparation for submission of the Bid, regardless of the conduct or outcome of the Selection process.

## 2. Glossary

Terms	Meaning
AMC	Allahabad Municipal Corporation
ANPR	Automatic Number Plate Recognition
AP	Access Points
ASCL	Allahabad Smart City Limited
ATCS	Adaptive Traffic Control System
BOM	Bill of Material
CCHS	Central Clearing House solution
CCTV	Closed Circuit Television
CCC	Command and Control Center
CONOPS	Concept of Operations
DC	Data Center
DRC	Disaster Recovery Center
FMS	Facility Management Services
GIS	Geographical Information Systems
GPS	Global Positioning System
GSM	Global System for Mobile Communication
ICCC	Integrated Command and Control Center
ICT	Information and Communication Technology
IP	Internet Protocol
IT	Information Technology
ITMS	Intelligent Traffic Management System
KPI	Key Performance Indicator
KM CCC	Kumbh Mela Command Control Center
MCR CCC	Modern Control Room (MCR) Command Control Center
MLCP	Multi-Level Car Park
MPLS	Multi-Protocol Label Switching
MSI	Master Systems Integrator
ONVIF	Open Network Video Interface Forum
O&M	Operations and Maintenance
OEM	Original Equipment Manufacture
OFC	Optical Fiber Cable
OWASP	Open Web Application Security Project
PKI	Public Key Infrastructure
PIS	Public Information System
PA System	Public Address System

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PoP	Point of Presence
PTZ	Pan Tilt Zoom
RFP	Request for Proposal
RLVD	Red Light Violation Detection
RTO	Recovery Time Objective
RPO	Recovery Point Objective
SCADA	Supervisory control and data acquisition
SLA	Service Level Agreement
SMS	Short Message Service
SOP	Standard Operating Procedures
TPA	Third Party Auditor
UAT	User Acceptance Testing
UPS	Uninterrupted Power Supply
VM	Virtual Machine
VMD	Variable Message Display
VCA	Video Content Analysis

### **3. Introduction**

#### **3.1. Project Background**

Smart city Mission was launched by Prime Minister Shri Narendra Modi on 25 June, 2015. Allahabad city was selected among 100 cities to be developed as smart city in India due to various achievements, initiatives and all-inclusive approach. Accordingly Allahabad city had submitted “Smart City Proposal” (SCP) for Allahabad City to Ministry of Urban Development, Government of India with required consent of Government of Uttar Pradesh and statutory authority of Allahabad Municipal Corporation.

Based on Citizens Poll for Pan City initiatives, ICT based Integrated Command & Control Center (ICCC) has been finalized as one of the important smart solutions in Smart City Proposal and shall be implemented in entire area of Allahabad city.

The Client- Allahabad Smart City Limited (ASCL) now intends to select a Master Systems Integrator for implementation of Integrated Command & Control Center (ICCC) in Allahabad City.

#### **3.2. About The Allahabad Smart City Limited (ASCL)**

As per the GoI guidelines, Allahabad Municipal Corporation has formed a separate Special Purpose Vehicle (SPV) as Allahabad Smart City Limited (ASCL) for the implementation of Smart City Projects under the smart city mission for the city of Allahabad. This SPV shall carry end-to-end responsibility for vendor selection, implementation and operationalization of various smart city projects.

#### **3.3. Introduction to Allahabad Smart City Project**

Allahabad, also known as Prayag, is one of the Smart Cities selected in the state of Uttar Pradesh in India. It is the administrative headquarters of the Allahabad District. It is one of the largest commercial centers in Uttar Pradesh, having the second-highest per capita income and the third-greatest GDP in the state.

The Allahabad Kumbh Mela is a mela held every 12 years at Prayag (Allahabad), India. The exact date is determined according to Hindu astrology: the Mela is held when Jupiter is in Taurus and the sun and the moon are in Capricorn. The fair involves ritual bathing at Triveni Sangam, the meeting points of three rivers: the Ganga, the Yamuna and the mythical Sarasvati. The last Allahabad Maha Kumbh Mela took place in 2013 and became the largest religious gathering in the world with almost 120 million visitors. The next Maha Kumbh Mela is scheduled for 2025 and Kumbh Mela scheduled for 2019.

The Allahabad Smart City Limited (ASCL) under their PAN City Projects, have envisaged implementing Integrated Command & Control Center (ICCC) across Allahabad city. ASCL plans to utilize information technology to modernize key functions of city operations including traffic management, Traffic control, Traffic Law enforcement, security and safety, e-governance, municipal operations, information dissemination etc. in the city to build a well-informed, connected, smart and smooth operations for citizens of the city.



The key objective of this project is to establish a collaborative framework where input from different functional departments such as transport, water, fire, police, meteorology, e-governance, etc. can be assimilated and analyzed on a single platform; consequently resulting in aggregated city level information.

The geographical coverage of the project has been divided in two categories as mentioned below:

1. ICCC for Pan City Area from Smart City perspective
2. City Surveillance for areas impacting from Kumbh Mela 2019 perspective

#### **3.4. ICCC for Pan City area from Smart City perspective**

ICCC for Pan City area shall enable collation of information and collaborative monitoring, thus helping in the analysis of data for quicker decision making. Intelligent operations capability shall ensure integrated data visualization, real-time collaboration and deep analytics that can help different stakeholders prepare for exigencies, coordinate and manage response efforts, and enhance the ongoing efficiency of city operations. The interface at ICCC gives a real-time and unified view of operations. Cities can share information across agency lines in real-time to accelerate problem response and improve project coordination. Furthermore, the ICCC shall help in anticipating the challenges and minimizing the impact of disruptions.

#### **3.5. CCTV Surveillance for areas impacted from Kumbh Mela 2019 perspective**

The vision of this project is to implement holistic and integrated video surveillance system for Kumbh Mela 2019 in Allahabad City for, areas mentioned below. This system shall be implemented with the objective of enhancing safety and security in the city during the Kumbh Mela 2019. The system is expected to -

1. Support police to maintain Law and Order
2. Act as an aid to investigation
3. Improve Crowd Management
4. Help in deterring, detecting and thus dealing with criminal activities
5. Monitor select vital public places of Kumbh Mela 2019 in Allahabad City for keeping eye on regular activities & for disaster management support

#### **3.6. Envisaged Benefits**

Following are the intangibles that should be addressed by this intervention:

1. Enable real-time monitoring of the various facets of management of Allahabad Smart City i.e. Security, Traffic and City Utilities.
2. Increased Traffic Efficiency: Reduction in stoppage time, optimized cycle times of intersection to regulate and maintain free flow of traffic to enhance the efficiency of the road & transport infrastructure.

3. Increased Travel Speed: Intelligent Signals shall reduce vehicle congestion on roads based on optimized signaling and thus increase the travel speed.
4. Increase Operational Efficiency: City Authorities intends to spend more time on the public facing functions. Thus Information technology solutions should help in reducing the repetitive paperwork/records and making the back-office functions more efficient.
5. Improve Traffic Services: The traffic services to the public can be improved through the user friendly presentation of the various traffic information in real time. Disabled friendly traffic signals should help in providing convenient services to disabled citizens of the city.
6. Safety Improvement: The real-time traffic monitoring and intelligent traffic control can prevent accidents by recognizing and thus responding to the potentially dangerous situation in advance.
7. Higher Productivity: Achieving improvement in the productivity, logistics and other economic activities by obtaining the precise-real time information on transport due to the availability of data on traffic flow in key areas of the city.
8. Real Time Information & Response: The real-time information at the ICCC shall enable the operator to take necessary actions based on the real time information and execute the required responses such as sending an emergency vehicle to the spot, arranging alternate route to VIP convoys, diverting the traffic to different routes etc. It shall be possible to track a particular event using the cameras installed at the traffic junction.
9. Creating awareness and Education of public: Through sign boards, awareness on road traffic rules and safe driving precautions shall be imparted to road users.
10. Enforcement: Effective enforcement of traffic violation, checking and monitoring shall reduce the traffic related offences like Red Light violation, Stop line violations etc.
11. Reduction in Social Cost: The overall social cost can be saved by easing the traffic congestion by utilizing the optimally allocated real time traffic information
12. Create a platform for sharing traffic information across the city: There is a critical need to create a platform for sharing traffic related information among traffic police and citizens in order to increase the effectiveness of Intelligent Traffic Management System.
13. Pollution Control: To reduce pollution with a cleaner Air in the city due to improved traffic
14. Security and Safety: Live Surveillance through a network of CCTV Cameras shall help to identify, apprehend and prosecute offenders and provide live alerts in case of events and incidents.
15. Effective & Preventive Policing: The technological interventions proposed for traffic regulation enforcement and CCTV coverage shall enable quick tapping of issues in the form of data and maps such as crime mapping, blind spots, accidental zones, peak hour

traffic count, average travel time, etc. This shall enable the police department to reduce crime and do preventive policing.

16. Reduce Congestion and Emissions: Smart parking enables better and real time monitoring and managing of available parking space, and guides residents and visitors to nearby available parking facility resulting reduction of emission of CO<sub>2</sub> and other pollutants. Thus it creates a better environment.
17. Provide capability to respond in a unified manner to situations on ground (both day to day and emergency situations) by creating a common operational picture for the relevant stakeholder
18. Provide and manage touch points from all concerned stakeholders during the lifecycle of various incidents
19. Define and manage the Key Performance Indicators (KPIs) for various systems deployed under enhancement and operational aspects of the City Management
20. Provide capability to conduct analysis for continuous improvement of city operations
21. Better management of utilities and quantification of services
22. Disaster Management and Emergency Response System
23. Asset Management
24. Provide and manage system for transit management
25. Generate Alerts over different modes of communication related to core systems deployed for objectives of smart city project

Allahabad Smart City Limited envisages deployment of following components to achieve the above mentioned objectives:

1. Intelligent Traffic Management System (ITMS)
2. City Surveillance System
3. Transit Management System for City Buses
4. Solid Waste Management
5. Environmental Sensors
6. Smart Parking System
7. Network Connectivity
8. Data Center (DC)
9. Disaster Recovery Center (DRC)
10. Viewing Centers
11. Command & Control Centers (CCCs)
12. Integrated Command & Control Center (ICCC)

## **4. Project Components**

### **4.1. Components & Services Overview**

The Master System Integrator (MSI) should ensure the successful implementation of the Integrated Command & Control Center (ICCC) project in Allahabad city and provide capacity building support to city authorities as per the scope of services described below. Any functionality not expressly stated in this document but required to meet the needs of the ASCL as specified in the scope in this RFP and captured during assessment/requirement gathering phase of project shall essentially be under the scope of the MSI to ensure successful operations of the system and for that no extra charges shall be admissible. MSI shall implement and deliver the following systems and components:

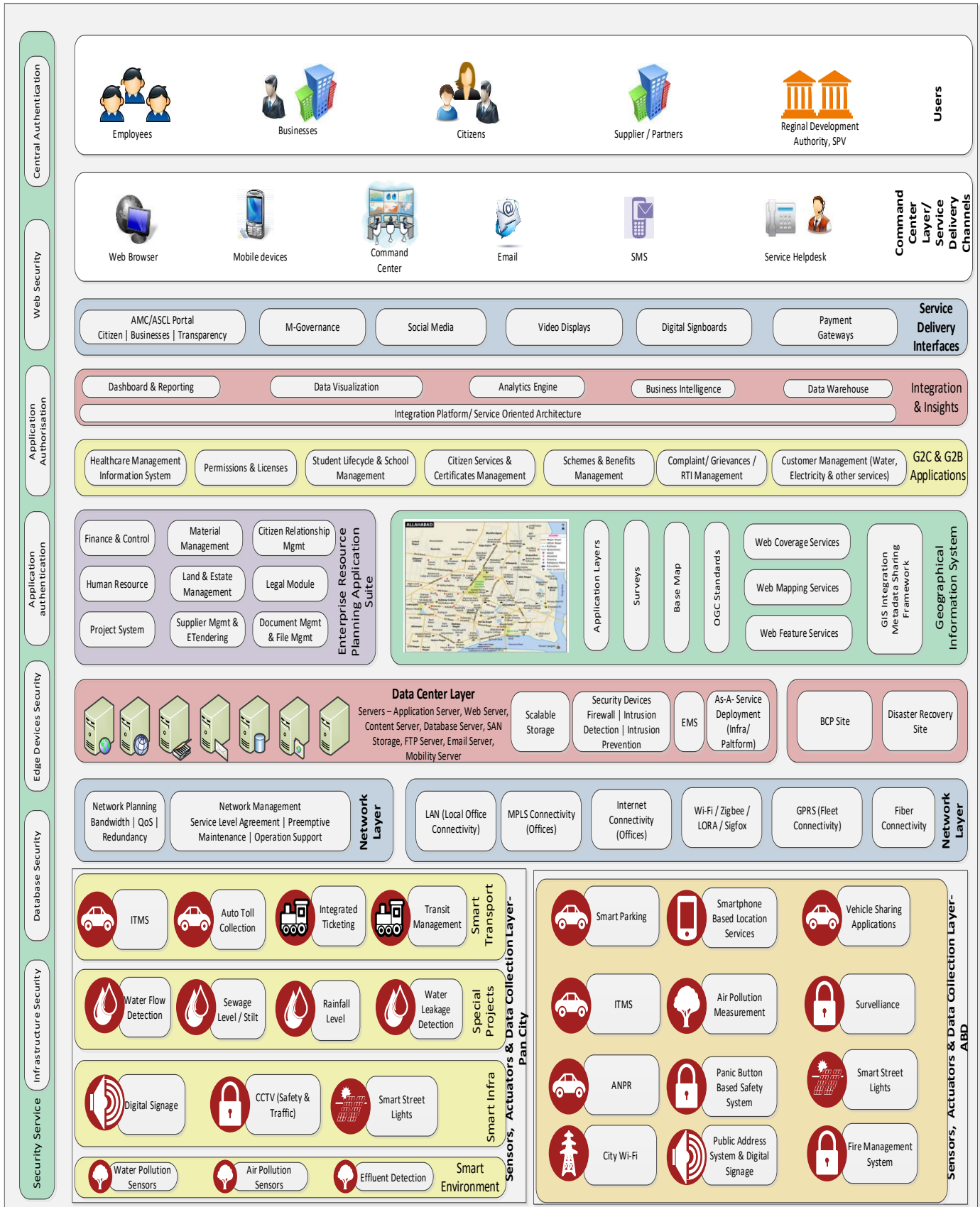
1. Intelligent Traffic Management System (ITMS)
2. City Surveillance System
3. Transit Management System for City Buses
4. Solid Waste Management
5. Environmental Sensors
6. Smart Parking System
7. Network Connectivity
8. Data Center (DC)
9. Disaster Recovery Center (DRC)
10. Viewing Centers
11. Command & Control Centers (CCC)
12. Integrated Command & Control Center (ICCC)
13. Integration of existing/proposed/future ICT systems:
  - a. City Surveillance System
  - b. Intelligent Traffic Management System
  - c. Solid waste management
  - d. Smart Parking
  - e. Transit Management System for City Buses
  - f. Panic Button/Emergency Call Box
  - g. Public Address System
  - h. Environmental sensors
  - i. Smart Poles
  - j. Smart Lighting
  - k. Smart Governance
  - l. City Network
  - m. City Wi-Fi
  - n. Water SCADA & Smart Meters
  - o. Sewerage
  - p. Storm water Drainage
  - q. Electrical SCADA and Smart Meters
  - r. E-Medicine/Health
  - s. E-Education

- t. Disaster Management
- u. Grievance Management
- v. Geographical Information System
- w. Public Bike Sharing System
- x. Allahabad City Card/Wallet/Smart Payment
- y. Fire
- z. GIS based Property Tax Management
- aa. Allahabad City MobileApp and Portal
- bb. Any other sensors/systems

#### **4.2. Solution Architecture**

The indicative solution architecture of ICCC and associated system components envisaged is as given below:

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**a. Sensors, Actuators and Data Collection Layer**

The Sensor and Actuator layer shall help the city administration gather information about the ambient city conditions or capture information from the edge level devices like intelligent traffic signals, cameras, enforcement sensors, etc. Allahabad city shall be expected to have multiple environmental sensors across the city, to measure ambient conditions such as air pollution, noise pollution etc.

Traffic Controller processes the data, that shall be an input from the sensor, applies the logic of control which should results in an output action. This signal shall be may directly to the controlled device or to other logical control functions and ultimately to the controlled device.

The Controller shall compare its input (from the sensor) with a set of instructions such as set point, throttling range and action, then should produce an appropriate output signal. It shall consists of control response along with other logical decisions that should be unique to the specific control application. After taking the logical decision of the information, it shall hand over the information to the next layer (Network Layer) which shall subsequently be available at the ICCC.

**b. Network Layer**

The secured network layer shall serve as the backbone for the project and provide connectivity to gather data from sensors and communicate messages to display devices and actuators. It shall support all the smart urban solutions (sensors and displays) at given locations. The network layer shall be scalable such that additional sensors, actuators, display devices can be seamlessly added in future. Provisioning of bandwidth shall be done by the bidder as part of their scope for the Implementation of ICCC project.

**c. Data Center Layer**

The data center layer shall house centralized computing power required to store, process and analyze the data to decipher actionable information. This layer includes servers, storage, ancillary network equipment elements, security devices and corresponding management tools. Similar to the network layer, it shall be scalable to cater to the increasing computing and storage needs in future.

**d. Smart Application and Integration Layer**

The smart applications layer shall contain data aggregation and management systems (rules engines, alerting systems, diagnostics systems, control systems, messaging system, events handling system), and reporting / dashboard system to provide actionable information to city administrators and citizens. It shall be an evolving layer with applications added and integrated as and when new applications would be developed at ASCL. While aspects of ambient conditions within the city shall be gathered through various sensors deployed, some city specific data shall come from other government and non-government agencies. The integration layer should be responsible for data exchanging to and from the under lying architecture components and other data from system developed by government (such as police department, meteorological department, street lights department, water department, irrigation department, transport organizations within Allahabad , etc.) and non-government agencies.

**e. Command Center Layer/Service Delivery Channels**

The Service delivery layer shall contain display devices or bi-directional (input & output) devices connected to the network which shall be used by citizens to consume - and for administrators to provide - actionable information. Such field devices includes digital messaging boards, environmental data displays, etc.

The command center and control units shall enable citizens and administrators alike to get a holistic view of city conditions. Such control units shall take shape of either an exhaustive command center or control applications which can be viewed over a web browser or available in form of a mobile application. The MSI shall have to develop a command center at site location determined by ASCL and web/ mobile based viewing tools for understanding the ambient city conditions.

**f. Security Layer**

As ambient conditions, actuators and display devices would be connected through a network, security of the entire system becomes of paramount significance and the MSI shall have to provide:

- Infrastructure security- including policies for identity and information security policies
- Network security- including policies and practices adopted to prevent and monitor unauthorized access, misuse, modification, or denial of a computer network and network-accessible resources, etc.
- Identity and Access Management – including user authentication, authorization, SSL & Digital Signatures
- Application security- including Hosting of Government Websites and other Cloud based services, Adoption of Technical Standards for Interoperability Framework and other standards published by GoI for various eGovernance applications

Following security parameters should be included for the ICCC project, but not limited to:

- Identity and access management
- User/administrator audit log activity (logon, user creation, date-time of PA announcements, voice recording etc.)
- Secured data storage (storage of video/image/voice/location/data captured by various smart elements)
- SSL/TLS encryption for web and mobile application based interfaces for sensitive data transfer
- Protection against Denial of Service (DoS) and Interference attacks



## **5. Scope of Services**

### **5.1. Geographical Scope of services**

The following is a summary of the geographical extent of the project.

#	System Description	Locations
1.	Intelligent Traffic Signals/Blinkers	43 Locations
2.	Surveillance System (Fixed and PTZ Cameras)	363 Locations
3.	ANPR Cameras	23 Locations
4.	Red Light Violation Detection System at Intersection	18 Locations
5.	Variable Message Display (VMD) Boards	40 Locations
6.	CCTV Cameras for ACTSL Buses	250 Buses
7.	Passenger Information System (PIS) for Bus Shelters	20 Locations
8.	Surveillance System & Passenger Information System (PIS) for Bus Terminals	3 Locations
9.	Surveillance System for Bus Depots	4 Locations
10.	Smart Parking System for Multi-Level Car Parking (MLCP)	1 Location
11.	Environmental Sensors	28 Locations
12.	RFID Tags for Bulk Generators	1000 Locations
13.	Surveillance System for Secondary Collection Centers, SWM Plant and Vulnerable Garbage Points	97 Locations
14.	Viewing Centers	4 Locations
15.	Data Center (DC)	One DC at Allahabad Municipal Corporation
16.	Disaster Recovery (DR) Center	Cloud
17.	Command & Control Centers (CCC)	Two CCCs: 1. Kumbh Mela CCC (KM CCC) 2. Modern Control Room CCC (MCR CCC)
18.	Integrated Command & Control Center (ICCC)	One ICCC at Allahabad Municipal Corporation (AMC)

The Indicative list of locations to be covered under this project are provided as Annexure IX.

### **5.2. Overview of Scope of Services**

The MSI's scope of work shall include but not limited to the following broad areas. Details of each of these broad areas have also been outlined in Annexure II.

1. Assessment, Scoping and Survey Study: Conduct a detailed assessment, scoping study and develop a comprehensive project plan, including:

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- a. Assess existing systems, street infrastructure and connectivity within the city for the scope items mentioned in section 4.1
  - b. Conduct site survey for finalization of detailed technical architecture, gap analysis and project plan
  - c. Conduct site surveys to identify need for site preparation activities
  - d. Obtain site Clearance obligations & other relevant permissions
2. Design, Supply, Installation, Commissioning and Testing which includes the following components:
  - a. Intelligent Traffic Management System (ITMS)
  - b. City Surveillance System
  - c. Transit Management System for City Buses
  - d. Solid Waste Management
  - e. Environmental Sensors
  - f. Smart Parking System
3. Establishment of network based on Lease line/MPLS connectivity and Internet connectivity for operations of ICCC & Kumbh Mela Surveillance system project
4. Provisioning Hardware and Software Infrastructure which includes design, supply, installation, and commissioning of IT Infrastructure at Data Center (DC), Disaster Recovery Center (DRC), Viewing Centers, Command & Control Center (CCC) and Integrated Command & Control Center (ICCC). This consist of:
  - a. Basic Site preparation services
  - b. IT Infrastructure including server, storage, other required hardware, application portfolio, licenses
  - c. Command Center infrastructure including operator workstations, IP phones, joystick controller etc.
  - d. Establishment of LAN and WAN connectivity at command centers and DC limited to scope of infrastructure procured for the project
5. Phase wise Integration of the ICT systems with Integrated Command & Control Center (ICCC):
  - a. City Surveillance System
  - b. Intelligent Traffic Management System
  - c. Solid waste management
  - d. Smart Parking
  - e. Transit Management System for City Buses
  - f. Panic Button/Emergency Call Box

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- g. Public Address System
  - h. Environmental sensors
  - i. Smart Poles
  - j. Smart Lighting
  - k. Smart Governance
  - l. City Network
  - m. City Wi-Fi
  - n. Water SCADA & Smart Meters
  - o. Sewerage
  - p. Storm water Drainage
  - q. Electrical SCADA and Smart Meters
  - r. E-Medicine/Health
  - s. E-Education
  - t. Disaster Management
  - u. Grievance Management
  - v. Geographical Information System
  - w. Public Bike Sharing System
  - x. Allahabad City Card/Wallet/Smart Payment
  - y. Fire
  - z. GIS based Property Tax Management
  - aa. Allahabad City MobileApp and Portal
  - bb. Any other sensors/systems
6. Capacity Building for ASCL and other end user department which includes preparation of operational manuals, training documents and capacity building support, including:
- a. Training of the city authorities, police personnel and operators on operationalization of the system
  - b. Support during execution of acceptance testing
  - c. Preparation and implementation of the information security policy, including policies on backup and redundancy plan
  - d. Preparation of KPIs for performance monitoring of various urban utilities monitored through the system envisaged to be implemented as per the project requirements

- e. Developing standard operating procedures for operations management and other services to be rendered by ICCC
- 7. One Time dismantling, transportation and Re-Installation of select field Infrastructure and Viewing Centers/CCC for post Kumbh Mela 2019
- 8. Preparation of system documents, user manuals, performance manuals, Operation manual etc.
- 9. Identification of Revenue generation opportunities by various smart solutions, planning and roll out of strategy
- 10. Operations and Maintenance services for the software, hardware and other IT and Non-IT infrastructure installed as part of the project after Phase wise Go-Live and for a period of 6 years from the date of phase wise Go-Live.

### **5.3. Assessment and Site Survey & finalization of detailed technical architecture**

After signing of contract, the Master Systems Integrator shall deploy local team (based out of Allahabad) proposed for the project and ensure that a Project Inception Report shall be submitted to ASCL which should cover following aspects:

- 1. Names of the Project Team members, their roles and responsibilities
- 2. Approach and methodology to be adopted to implement the Project (which should be in line with what has been proposed during bidding stage, but may have value additions / learning in the interest of the project).
- 3. Responsibility matrix for all stakeholders
- 4. Risks the MSI anticipates and the plans they have towards their mitigation
- 5. Detailed project plan specifying dependencies between various project activities / sub-activities and their timelines
- 6. Installation locations geo mapped preferably on google earth to visually identify the geographical area

The MSI shall conduct a comprehensive As-Is study of the existing infrastructure of traffic junctions/intersections during various time periods of day including peak and non-peak hours to establish the key performance indicators (KPI) for the ITMS System of ICCC project. The KPIs of the study shall be included in the survey. The following minimum parameters should be captured during the comprehensive study:

- 1. Volumes of vehicles moving in the road network within the area identified for ITMS implementation
- 2. Vehicle type distribution
- 3. Directional distribution

4. Physical and visual characteristics of the area
5. Travel times, delays between different points of the network
6. Additional dependencies with respect to the available infrastructure and geometry at the junctions
7. Any other relevant data which the MSI anticipates shall assist in establishing the benchmarks for the project

The report shall also include the expected measurable improvements against each KPI as detailed out in the above 'As-Is' study after implementation of ICCC project. The benchmarking data should also be developed to track current situation and desired state.

The Master Systems Integrator shall study the existing business processes, functionalities, existing ICT systems and applications including MIS reporting requirements.

The MSI shall be responsible to propose transition strategy for dismantling of existing traffic signals, and setting up of new signals and field components. The proposed strategy should clearly provide approach and plan for implementing the new signals and field components while ensuring minimum disturbance to the road traffic and shall use appropriate static signage designating the work in progress status.

Additionally, the MSI should provide a detailed To-Be designs (Junction layout plans) specifying the following:

1. High Level Design (including but not limited to) Application architecture, Logical and physical database design, Data dictionary and data definitions, ER diagrams and other data modelling documents and Physical infrastructure design for devices on the field
2. Application component design including component deployment views, control flows, etc.
3. Low Level Design (including but not limited to) Application flows and logic including pseudo code, GUI design (screen design, navigation, etc.), Database architecture, including defining data structure, data dictionary as per standards laid-down by Government of India/ Government of Uttar Pradesh
4. Location of all field systems and components proposed at the junctions, (KML /KMZ file plotted on GIS platform like google earth etc.)
5. Height and foundation of Cameras, Traffic Signals and Standard Poles for Pedestrian signals, Height and foundation of Poles, cantilevers, gantry and other mounting structures for other field devices
6. Location of Junction Box
7. Location of Network Provider's Point of Presence (PoP)

8. Design of Cables, Ducts routing, digging and trenching
9. Electrical power provisioning

The MSI shall also identify the customizations/ workaround that would be required for successful implementation and operation of the ICCC project. The MSI shall submit the detailed Technical Architecture, which should take into consideration following guiding principles:

1. **Scalability** - Important technical components of the architecture must support scalability to provide continuous growth to meet the growing demand of the city. The system should also support vertical and horizontal scalability so that depending on changing requirements from time to time, the system may be scaled upwards. There must not be any system imposed restrictions on the upward scalability in number of cameras, data center equipment or other smart city components. Main technology components requiring scalability are storage, bandwidth, computing performance (IT Infrastructure).

The architecture should be scalable (cater to increasing load of internal and external users and their transactions) and capable of delivering high performance till the system is operational. In this context, it is required that the application and deployment architecture should provide for Scale-Up and Scale out on the Application and Web Servers, Database Servers and all other solution components. The data center infrastructure shall be capable of serving the growing concurrent users requirement which would be increasing as the city would grow.

2. **Availability** - The architecture components should be redundant and ensure that are no single point of failures in the key solution components. Considering the high sensitivity of the system, design should be in such a way as to be resilient to technology sabotage. To take care of remote failure, the systems should to be configured to mask and recover with minimum outage. The MSI shall make the provision for high availability for all the services of the system. Redundancy has to be considered at the core / data center components level.
3. **Security** - The architecture should adopt an end-to-end security model that protects data and the infrastructure from malicious attacks, theft, natural disasters etc. MSI should make provisions for security of field equipment as well as protection of the software system from hackers and other threats. Using Firewalls and Intrusion Prevention Systems such attacks and theft should be controlled and well supported (and implemented) with the security policy. The virus and worm attacks should be well defended with gateway level Anti-virus system, along with workstation level Anti-virus mechanism. There should also be an endeavor to make use of the SSL/VPN technologies to have secured communication between Applications and its end users. Furthermore, all the system logs should be properly stored & archived for future analysis and forensics whenever desired. ASCL would carry out the security audit of the entire system upon handover and also at regular interval during O&M period. Bidder's solution shall adhere

to the model framework of cyber security requirements set for Smart City (K-15016/61/2016-SC-1, Government of India, and Ministry of Urban Development).

Field equipment installed through the ICCC project would become an important public asset. During the contract period of the Project the MSI shall be required to repair / replace any equipment if stolen / damaged/faulty. Appropriate insurance cover must be provided to all the equipment's supplied under this project.

The systems implemented for project should be highly secure, considering that it is intended to handle sensitive data relating to the city and residents of the city. The overarching security considerations are described below:

- a. The security services used to protect the solution shall include: Identification, Authentication, Access Control, Administration and Audit and support for industry standard protocols.
- b. The solution shall support advanced user authentication mechanisms including digital certificates and biometric authentication.
- c. Security design should provide for a well-designed identity management system, security of physical and digital assets, data and network security, backup and recovery and disaster recovery system.
- d. The solution should provide for maintaining an audit trail of all the transactions and should also ensure the non-repudiation of audit trail without impacting the overall performance of the system.
- e. The overarching requirement is the need to comply with ISO 27001 standards of security.
- f. The application design and development should comply with OWASP top 10 principles

The bidders should refer to the detailed Cyber Security requirements for Allahabad Smart City ICCC project as provided in Annexure VI of this document.

4. **Manageability** - Ease of configuration, ongoing health monitoring, and failure detection are vital to the goals of scalability, availability, and security and must be able to match the growth of the environment. Network should be auto/manual configurable for various future requirements for the ease of maintenance / debugging.
5. **Interoperability** - The system should have interoperable capability with the ICT Systems and also shall take feeds from cameras installed by private / Govt. at public places, digitize (if required) & compress (if required) this feed & store as per requirements.

6. **Open Standards** - Systems should use open standards and protocols. Keeping in view the evolving needs of interoperability, especially the possibility that the solution shall become the focal point of delivery of services, and may also involve cross-functionality with the e-Government projects of other departments / businesses in future, the solution should be built on Open Standards. The MSI shall ensure that the application developed is easily integrated with the existing applications. The code does not build a dependency on any proprietary software, particularly, through the use of proprietary 'stored procedures' belonging to a specific database product. The standards should at least comply with the published eGovernance standards, frameworks, policies and guidelines available on <http://egovstandards.gov.in> (updated from time-to-time)
7. **Universal Access IT Systems:** The solution designed should ensure Universal Access to IT systems to empower citizens of Allahabad city with disability to access the various systems/components envisaged and future systems for integrations with ease. The bidders should refer to Annexure VI for minimum requirements for Universal Access to IT Systems.
8. **Single-Sign On-** The application should enable single-sign-on so that any user once authenticated and authorized by system is not required to be re-authorized for completing any of the services in the same session. For employees of the department concerned, the browser based application accessed on the intranet, through single-sign-on mechanism, shall provide access to all the services of the departments concerned (based on their roles and responsibilities), Help module, basic and advanced reporting etc. Similarly, for external users (citizens, etc.), based on their profile and registration, the system shall enable single-sign on facility to apply for various services, make payments, submit queries /complaints and check status of their applications.
9. **Support for PKI-based Authentication and Authorization-** The solution shall support PKI based Authentication and Authorization, in accordance with IT Act 2000, using the Digital Certificates issued by the Certifying Authorities (CA). In particular, 3 factor authentications (login id & password, biometric and digital signature) shall be implemented by the MSI for officials/employees involved in processing citizen services.
10. **Convergence** - ASCL has already initiated many projects which have state of the art infrastructure at field locations deployed under them. The ICCC Infrastructure should be made scalable for future convergence needs. Under the smart city program, ASCL has envisaged to create a state of the art infrastructure and services for the citizens of Allahabad, hence it is imperative that all infrastructure created under the project shall be leveraged for maximum utilization. Hence the MSI is required to ensure that such infrastructure shall allow for accommodation of equipment's being procured under other smart city projects. Equipment like Junction Boxes and poles deployed under the ICCC project at the field locations shall be utilized to accommodate field equipment's created under the other projects of ASCL. The procedure for utilization of the infrastructure shall be mutually agreed between the ASCL and Master System Integrator.



11. All the personnel working on the Project and having access to the Servers / Data Center should be on direct payroll of the MSI/OEM/Consortium partner. The MSI would not be allowed to sub-contract work, except for following:
  - a. Passive networking & civil work during implementation and O&M period,
  - b. Viewing manpower at CCC/ICCC / viewing centers during post-implementation
  - c. FMS staff for non- IT support during post-implementation
  - d. Services of professional architect for design of CCC/ICCC/Viewing centers

However, even if the work is sub-contracted, the sole responsibility of the work shall lie with the MSI. The MSI shall be held responsible for any delay/error/non-compliance/penalties etc. of its sub-contracted vendor. The details of the sub-contracting agreements (if any) between both the parties would be required to be submitted to ASCL and approved by the ASCL before resource mobilization.

12. **GIS Integration-** MSI shall undertake detailed assessment for integration of the e-Governance, Surveillance System and all other components with the Geographical Information System (GIS). MSI is required to carry out the seamless integration to ensure ease of use of GIS in the Dashboards in ICCC. If this requires field survey, it needs to be done by MSI. If such a data is already available with city, it shall facilitate to provide the same. MSI is to check the availability of such data and it's suitability for the project. MSI is required to update GIS maps from time to time.
13. **SMS Gateway Integration-** MSI shall carry out SMS Integration with the Smart City System and develop necessary applications to send mass SMS to groups/individuals. Any external/third party SMS gateway can be used, but this needs to be specified in the Technical Bid, and approved during Bid evaluation.
14. **Application Architecture**
  - a. The applications designed and developed for the departments concerned must follow best practice and industry standards. In order to achieve the high level of stability and robustness of the application, the system development life cycle must be carried out using the industry standard best practices and adopting the security constraints for access and control rights. The various modules / application should have a common Exception Manager to handle any kind of exception arising due to internal/ external factors. The standards should at least comply with the published eGovernance standards, frameworks, policies and guidelines available on <http://egovstandards.gov.in> (updated from time-to-time)
  - b. The modules of the application are to be supported by the Session and Transaction Manager for the completeness of the request and response of the client request. The

system should have a module exclusively to record the activities/ create the log of activities happening within the system / application to avoid any kind of irregularities within the system by any User / Application.

- c. MSI shall design and develop the ICCC System as per the Functional and System requirement specifications finalized.
  - i. The Modules specified shall be developed based on approved requirement.
  - ii. Apart from this, if some services are already developed/under development phase by the specific department, such services shall be integrated with the ICCC System. These service shall be processed through department specific Application in backend.
- d. The standards should at least comply with the published eGovernance standards, frameworks, policies and guidelines available on <http://egovstandards.gov.in> (updated from time-to-time).
- e. The application should have a module for management of digital signature including issuance, renewal and suspension of digital signatures based on the administrative decisions taken by the State.
- f. MSI shall ensure using Digital signatures/eAuthentication (Aadhar Based) to authenticate approvals of service requests etc.
  - The MSI should be able to measure and monitor the performance of the deployed infrastructure and all SLAs set out in this RFP. More importantly, it should be possible to monitor in REALTIME, the number of citizens touched through e-Services each day, month and year, through appropriate tools and MIS reports.
  - The Infrastructure management and Monitoring System shall be used by MSI to monitor the infrastructure (Both IT and Non-IT) hosted at the Data center and DR site.
  - For monitoring of uptime and performance of IT and non IT infrastructure deployed, the MSI shall have to provision for monitoring and measurement tools, licenses, etc. required for this purpose.
- i. The ICCC Application should integrate with key initiatives of State namely Portal Services, Citizen Contact Center, and Certifying Authority etc.
- ii. Complete mobile enablement of the ICCC System

15. The functional requirements and technical specifications provided in this RFP are indicative and carry guiding rule. The MSI is free to offer products and solutions which meet requirements of the RFP focusing on the outcome, future scalability, security, reliability and adherence to specified SLA under this RFP, in line with applicable standards & best practices adopted in the industry. The MSI is encouraged to design an Optimized solution which is technically superior, innovative, proven, better in terms of functionality and is cost effective. Any specified parameters mentioned in the scope/technical requirement in the RFP may be considered if it is required for meeting current & future requirements during the contract period. The MSI is fully responsible for the specified outcome to be achieved.

#### **5.4. Site Clearance obligations & other relevant permissions**

##### **5.4.1. Survey and Commencement of Works**

Prior to starting the site clearance, the MSI shall carry out survey of field locations as specified in Annexure IX, for buildings, structures, fences, trees, existing installations, etc. The ASCL shall be fully informed of the results of the survey and the amount and extent of the demolition and site clearance shall then be agreed with the ASCL.

##### **5.4.2. Existing Traffic Signal system**

The infrastructure of existing traffic signal systems including the aspects, controllers etc. shall be dismantled and replaced with the new systems which are proposed and required under the scope of the ICCC project. The dismantled infrastructure shall be delivered at the ASCL designated location without damage at no extra cost.

##### **5.4.3. Road signs**

All existing road signs which are likely to be effected by the works are to be carefully taken down and stored. Signs to be re-commissioned shall be cleaned, provided with new fixings where necessary and the posts re-painted in accordance with ASCL guidelines. Road signs, street name plate, etc. damaged by the MSI during their operation shall be repaired or replaced by MSI at no additional cost.

##### **5.4.4. Electrical works and power supply**

The MSI shall directly interact with electricity boards for provision of mains power supply at select/permanent locations for ICCC field systems. The MSI shall be responsible to pay the electricity bills including recurring charges etc. to the electricity board directly. MSI shall have to submit the challan of bill submission to ASCL. ASCL shall reimburse the amount submitted to the MSI after verification in next billing cycle.

##### **5.4.5. Lightning-proof measures**

The MSI shall comply with lightning-protection and anti –interference measures for system structure, equipment type selection, equipment earthing, power, signal cables laying. The MSI shall describe the planned lightning-protection and anti –interference measures in the As-Is report. Corresponding lightning arrester shall be erected for the entrance cables of power line, video line, data transmission cables. All crates shall have firm, durable shell. Shell shall have dustproof, antifouling, waterproof function & should capable to bear certain mechanical external force. Signal

separation of low and high frequency; equipment's protective field shall be connected with its own public equal power bodies; small size/equipment signal lightning arrester shall be erected before the earthling. The Internal Surge Protection Device for Data Line Protection shall be selected as per zone of protection described in IEC 62305, 61643-11/12/21, 60364-4/5. Data line protection shall be used for security system, server data path and other communication equipment. Data line protection shall be installed as per zone defined in IEC 62305. Type 1 device shall be installed between zone 0B and zone 1. Type 2 devices shall be installed before the equipment in zone 2 and

#### **5.4.6. Earthing System**

All electrical components are to be earthen by connecting two earth tapes from the frame of the component ring and shall be connected via several earth electrodes. The cable arm shall be earthen through the cable glands. The entire applicable IT infrastructure i.e. field locations/traffic junctions or command center shall have adequate earthing. Further, earthing should be done as per Local state national standard in relevance with IS standard.

1. Earthing should be done for the entire power system and provisioning should be there to earth UPS systems, Power distribution units, AC units, etc. so as to avoid a ground differential. ASCL shall provide the necessary space required to prepare the earthing pits.
2. All metallic objects on the premises that are likely to be energized by electric currents should be effectively grounded.
3. There should be enough space between data and power cabling and there should not be any cross wiring of the two, in order to avoid any interference, or corruption of data.
4. The earth connections shall be properly made.
5. A complete copper mesh earthing grid needs to be installed for the server farm area, every rack need to be connected to this earthing grid. A separate earthing pit needs to be in place for this copper mesh.
6. Provide separate Earthing pits for Servers, & UPS as per the standards.

#### **5.4.7. Junction Box, Poles and Cantilever**

1. The MSI shall provide the Junction Boxes, poles and cantilever to mount the field sensors like the cameras, traffic sensors, traffic light aspects, active network components, controller and UPS at all field locations.
2. The Junction Box needs to be appropriately sized in-order to accommodate the systems envisaged at the Junctions
3. The Junction Box for UPS with Battery bank needs to be considered separately
4. MSI shall ensure the Junction box design keeping in mind the scalability requirements of ICCC project
5. The junction box should be designed in a way that, separate compartment shall be available for separate system (i.e. ITMS Controller, Mini server, Active component, etc.).

Each compartment shall have lock & key facility. There should be provision made to integrate the systems if required.

6. At selected traffic junctions, the infrastructure of poles and cantilevers shall be provided by the client for mounting/installing the traffic light aspects. The details of such traffic junctions/locations are provided in Annexure VIII.

#### **5.4.8. Cabling Infrastructure**

1. The MSI shall provide standardized cabling for all devices and subsystems in the field.
2. MSI shall ensure the installation of all necessary cables and connectors between the field sensors /devices assembly, outstation junction box, for pole mounted field sensors /devices the cables shall be routed down the inside of the pole and through underground duct to the outstation cabinet.
3. All cables shall be clearly labeled with indelible indications that can clearly be identified by maintenance personnel. The proposed cables shall meet the valid directives and standards.
4. Cabling must be carried out per relevant BIS standards. All cabling shall be documented in a cable plan by the MSI.

#### **5.5. Design and Implementation of Integrated Command & Control Center System**

The MSI should ensure the successful implementation of the proposed ICCC Project as per the scope of services described below. MSI shall implement and deliver the following systems and capabilities linked with CCC & ICCC.

1. Adaptive Traffic Control System (ATCS)
2. Red Light Violation Detection (RLVD) System
3. E-Challan System
4. Variable Message Display (VMD) boards
5. Surveillance System
6. Automatic Number Plate Recognition (ANPR) System
7. Surveillance System for City Buses, Bus Terminals and Depots.
8. Passenger Information System for Bus Shelters, and Bus Terminals
9. Solid Waste Management
10. Environmental Sensors
11. Smart Parking System
12. Viewing Centers
13. Network Connectivity
14. Data Center (DC)
15. Disaster Recovery Center (DRC)
16. Command & Control Center (CCC)
17. Integrated Command & Control Center (ICCC)

The functional requirements and technical specifications provided in the below sections and at other sections in this section are indicative and carry guiding rule. The MSI is free to offer products

and solutions which meet requirements of the RFP focusing on the outcome, future scalability, security, reliability and adherence to specified SLA under this RFP, in line with applicable standards & best practices adopted in the industry. The MSI is encouraged to design an Optimized solution which is technically superior, innovative, proven, better in terms of functionality and is cost effective. Any specified parameters mentioned in the scope/technical requirement in the RFP may be considered if it is required for meeting current & future requirements during the contract period. The MSI is fully responsible for the specified outcome to be achieved.

#### **5.5.1. Design, Supply, Installation & Commissioning of the Field Equipment**

The Scope includes Supply, Installation, commissioning and Customization (as required) of various field systems which include Adaptive Traffic Control System (ATCS) at Traffic Junctions, Surveillance System, ANPR Cameras, Variable Message Display (VMDs), Red Light Violation Detection system, Environmental Sensors, Smart Parking System, SWM system, transit management system for city buses etc. and other IT infrastructure required for successful operations of the ICCC project.

Based on the approved Survey report, the MSI shall undertake the system configuration and customization in line with the changed, improved or specific requirements of Allahabad Police and ASCL including:

1. The implementation methodology and approach must be based on the global best practices in-order to meet the defined Service Levels during the operation.
2. Best efforts have been made to define major functionalities for each sub- system of ICCC system. However, MSI should not limit its offerings to the functionalities proposed in this RFP and is suggested to propose any functionality over and above what has already been given in this tender.
3. The MSI shall design the field level equipment architecture to ensure maximum optimization of network equipment, poles, cantilever, mounting infrastructures, power supply equipment including, electric meters and junction box.
4. Finally approved/accepted solution for each component of ICCC project shall be accompanied with "System Configuration" document and the same should be referenced for installation of ICCC systems at Junctions/Locations that are identified within the scope of this project.
5. The MSI shall be required to submit a detailed installation report post installation of all the equipment at approved locations. The report shall be utilized during the acceptance testing period of the project to verify the actual quantity of the equipment supplied and commissioned under the project.
6. The MSI shall be responsible for obtaining all permits and approvals necessary to install the ICCC systems components as per the approved design.

The sub-systems included as part of the ICCC project which are required to be implemented and integrated are given in the subsequent sections.

#### **5.5.1.1. Adaptive Traffic Control System (ATCS)**

The broad scope of work to be covered under ATCS sub module shall include the following, but is not limited to:

1. Preparation of Solution Architecture as per project blueprint to develop a final BOQ for installation traffic signaling systems.
2. Installation of vehicle detectors, controllers, Traffic light aspects, poles, cantilevers, Junction Box and other required accessories at 43 traffic junctions for successful operation of the ATCS for ASCL and Allahabad Traffic Police
3. Integration of ATCS field infrastructures with the proposed ATCS software application
4. Configuration of traffic signal at each of the junction along with development of signal control plan for individual operations, coordinated signal plan for the junction in sync with the area wide signal plan for different operating conditions. The operating conditions may include different peak and off-peak conditions, special events, contingency plans etc.
5. The MSI should design and propose energy saving signaling system by using solar powered signals or other advanced technologies.
6. The functional requirements and technical specifications provided in this RFP are indicative and carry guiding rule. The MSI is free to offer products and solutions which meet requirements of the RFP focusing on the outcome, future scalability, security, reliability and adherence to specified SLA under this RFP, in line with applicable standards & best practices adopted in the industry. The MSI is encouraged to design an Optimized solution which is technically superior, innovative, proven, better in terms of functionality and is cost effective. Any specified parameters mentioned in the scope/technical requirement in the RFP may be considered if it is required for meeting current & future requirements during the contract period. The MSI is fully responsible for the specified outcome to be achieved.
7. For more details on technical and functional specifications of ATCS, MSI should refer to Annexure I for Functional and Technical specifications.

#### **5.5.1.2. Surveillance System**

The broad scope of work to be covered under this sub module shall include the following, but is not limited to:

1. The MSI shall install Surveillance System Cameras for CCTV monitoring and management at 370 locations across the Kumbh Mela Area and Allahabad city.
2. The MSI shall undertake due diligence for selection and placement of surveillance cameras to ensure the optimized coverage of the traffic junction and other locations along with all associated junction arms, accuracy of the information captured on the field and for rugged operations.

3. The MSI shall design, supply, and install the surveillance cameras as defined in the RFP; all wiring connections for the system shall be installed by the MSI. The MSI shall supply all of the necessary equipment for the camera operations including camera housings and mountings, camera poles, switches, cabling, and shall make the final connections to the junction box.
4. The MSI shall be responsible for providing the entire necessary IT infrastructure for monitoring, recording, storage & retrieval of the video streams at Viewing Centers, CCC, ICCC or any other location as specified in the RFP.
5. The functional requirements and technical specifications provided in this RFP are indicative and carry guiding rule. The MSI is free to offer products and solutions which meet requirements of the RFP focusing on the outcome, future scalability, security, reliability and adherence to specified SLA under this RFP, in line with applicable standards & best practices adopted in the industry. The MSI is encouraged to design an Optimized solution which is technically superior, innovative, proven, better in terms of functionality and is cost effective. Any specified parameters mentioned in the scope/technical requirement in the RFP may be considered if it is required for meeting current & future requirements during the contract period. The MSI is fully responsible for the specified outcome to be achieved.
6. For more details on technical and functional specifications of Surveillance Cameras, MSI should refer to Annexure I for Functional and Technical specifications.

#### **5.5.1.3. Red Light Violation Detection (RLVD) System**

The broad scope of work to be covered under this sub module shall include the following, but is not limited to:

1. The MSI shall install the RLVD Systems at 18 traffic junctions across the city. This system shall capture the infractions of Red light and stop line violations at these junctions.
2. The MSI shall design, supply, and install the RLVD system as defined in the RFPs, all wiring connections to the traffic signal controllers and to the camera platforms shall be installed by the MSI. The MSI shall supply all of the necessary equipment for the camera and detection system, including but not limited to: computers, ancillary camera equipment, camera housings, camera poles, warning signs and shall make the final connections to the camera.
3. The solution proposed by the MSI shall seamlessly integrate with the E-Challan system proposed under the scope of this project. ASCL shall facilitate to get access to the Vaahan and Sarathi database. Bidder shall be required to access the same through use of appropriate APIs.
4. The MSI shall be responsible for providing all the necessary IT infrastructure for analysis, storage & retrieval of the infraction information at CCC & ICCC or any other location as specified in the RFP.



5. The functional requirements and technical specifications provided in this RFP are indicative and carry guiding rule. The MSI is free to offer products and solutions which meet requirements of the RFP focusing on the outcome, future scalability, security, reliability and adherence to specified SLA under this RFP, in line with applicable standards & best practices adopted in the industry. The MSI is encouraged to design an Optimized solution which is technically superior, innovative, proven, better in terms of functionality and is cost effective. Any specified parameters mentioned in the scope/technical requirement in the RFP may be considered if it is required for meeting current & future requirements during the contract period. The MSI is fully responsible for the specified outcome to be achieved.
6. For more details on technical and functional specifications of Red Light Violation Detection (RLVD) system, MSI should refer to Annexure I for Functional and Technical specifications.

#### **5.5.1.4. Variable Message Display (VMD) Boards**

The broad scope of work to be covered under this sub module shall include the following, but is not limited to:

1. The MSI shall install IP based VMD boards on approximate 40 locations across city of Allahabad. These VMD boards shall have different characteristics depending upon the location and purpose of installation. VMD board displays are to be controlled by Allahabad Traffic Police personnel from the CCC & ICC. The purpose of the VMD boards is to provide the commuters with information about traffic/congestion conditions and alternate routes/diversions in case of high traffic on roads.
2. The MSI, in consultation with Allahabad Police can propose alternate locations apart from the locations mentioned in this RFP for installing the VMD boards where their effectiveness in communicating information about traffic conditions in Allahabad shall be maximized.
3. Allahabad Police shall review and approve the proposed locations. The MSI shall install the VMD boards on the approved locations.
4. The functional requirements and technical specifications provided in this RFP are indicative and carry guiding rule. The MSI is free to offer products and solutions which meet requirements of the RFP focusing on the outcome, future scalability, security, reliability and adherence to specified SLA under this RFP, in line with applicable standards & best practices adopted in the industry. The MSI is encouraged to design an Optimized solution which is technically superior, innovative, proven, better in terms of functionality and is cost effective. Any specified parameters mentioned in the scope/technical requirement in the RFP may be considered if it is required for meeting current & future requirements during the contract period. The MSI is fully responsible for the specified outcome to be achieved.
5. For more details on technical and functional specifications of VMD boards, the MSI should refer to Annexure I for functional requirements and technical specifications.

#### **5.5.1.5. ANPR Cameras**

The broad scope of work to be covered under this sub module shall include the following, but is not limited to:

1. The MSI shall install the ANPR Cameras at 23 junctions/locations across the city. This system shall automatically capture the license number plate of the vehicle at these junctions.
2. The MSI shall design, supply, and install the ANPR camera system as defined in the RFPs, all camera accessories such as IR Illuminators, camera housing and mounting shall be installed by the MSI. The MSI shall supply all of the necessary equipment for the camera and local processing system, including but not limited to: computers, local storage, and ancillary camera equipment, camera poles, warning signs and shall make the final connections to the camera.
3. The MSI shall be responsible for providing all the necessary IT infrastructure for detection, analysis, storage & retrieval of the number plate information at ICCC or any other location as specified in the RFP.
4. The functional requirements and technical specifications provided in this RFP are indicative and carry guiding rule. The MSI is free to offer products and solutions which meet requirements of the RFP focusing on the outcome, future scalability, security, reliability and adherence to specified SLA under this RFP, in line with applicable standards & best practices adopted in the industry. The MSI is encouraged to design an Optimized solution which is technically superior, innovative, proven, better in terms of functionality and is cost effective. Any specified parameters mentioned in the scope/technical requirement in the RFP may be considered if it is required for meeting current & future requirements during the contract period. The MSI is fully responsible for the specified outcome to be achieved.
5. For more details on technical and functional specifications of ANPR Cameras, MSI should refer to Annexure I for Functional and Technical specifications.

#### **5.5.1.6. E-Challan Devices**

The MSI is required to supply 30 devices along with e-Challan application for spot challan issuance. The MSI is required to seamlessly integrate the handheld e-Challan application with the E-Challan system proposed under the scope of this project.

The functional requirements and technical specifications provided in this RFP are indicative and carry guiding rule. The MSI is free to offer products and solutions which meet requirements of the RFP focusing on the outcome, future scalability, security, reliability and adherence to specified SLA under this RFP, in line with applicable standards & best practices adopted in the industry. The MSI is encouraged to design an Optimized solution which is technically superior, innovative, proven, better in terms of functionality and is cost effective. Any specified parameters mentioned in the scope/technical requirement in the RFP may be considered if it is required for meeting current & future requirements during the contract period. The MSI is fully responsible for the specified outcome to be achieved.

#### **5.5.1.7. Design & Implementation of Environmental Sensors**

MSI shall require to design and install the environmental sensors at 28 strategic locations to display environment related information through Variable Message Display Boards. The environment sensors shall be integrated with the central control system at ICCC to capture and display/ provide feed on Temperature, Humidity, and Pollutants etc. The data collected shall be location-marked. Each environmental Sensor should be able to measure following parameters:

- Temperature
- Humidity
- CO
- CO2
- NO2
- SO2
- PM2.5
- PM 10

The functional requirements and technical specifications provided in this RFP are indicative and carry guiding rule. The MSI is free to offer products and solutions which meet requirements of the RFP focusing on the outcome, future scalability, security, reliability and adherence to specified SLA under this RFP, in line with applicable standards & best practices adopted in the industry. The MSI is encouraged to design an Optimized solution which is technically superior, innovative, proven, better in terms of functionality and is cost effective. Any specified parameters mentioned in the scope/technical requirement in the RFP may be considered if it is required for meeting current & future requirements during the contract period. The MSI is fully responsible for the specified outcome to be achieved.

For more details on technical and functional specifications of Environmental Sensors, the MSI should refer to Annexure I for functional requirements and technical specifications.

#### **5.5.1.8. Design & Implementation of Transit Management System for City buses**

1. The following locations would be covered for Transit Management system for city buses:

<b>Services to be Covered</b>	<b>End User Department/Nodal Agency</b>	<b>Coverage</b>
City Bus Services	Allahabad City Transport Services Limited (ACTSL)/ASCL	<ul style="list-style-type: none"><li>• Total ACTSL Buses: 250 Nos</li><li>• ACTSL Bus Terminals: 3 Locations</li><li>• ACTSL Bus Depots: 4 Locations</li><li>• Bus Shelters- 20 Locations</li></ul>

2. Design, Development, Supply, Integration and Implementation of following components of the hardware and software items specified hereunder.

**Request for Proposal (RFP) for Selection of Master System Integrator (MSI) for Implementation of Integrated Command & Control Center (ICCC) in Allahabad City**

Services	Hardware	Software
ACTSL	<p><b>Buses</b></p> <ul style="list-style-type: none"> <li>• CCTV Cameras and MDVR</li> <li>• ETM Handheld/ETM with printer for bar-coded ticket issuance and reader for smartcard readers for City Buses.</li> <li>• Pole based Entry/Exit Smart Card Validator for City Buses - Hardware Component.</li> </ul> <p><b>Bus Terminals</b></p> <ul style="list-style-type: none"> <li>• PIS Display units</li> <li>• Servers.</li> <li>• CCTV Cameras</li> <li>• PoS Machines</li> </ul> <p><b>Bus Shelters</b></p> <ul style="list-style-type: none"> <li>• PIS Display Units</li> </ul> <p><b>Depots</b></p> <ul style="list-style-type: none"> <li>• PIS Display Units</li> </ul>	<ul style="list-style-type: none"> <li>• Automatic Fare Collection System – Software.</li> <li>• Pole based Entry/Exit Smart Card Validator for ACTSL Buses - Software Component.</li> <li>• ETM Software Components for Buses.</li> <li>• Automatic Vehicle Locating System.</li> <li>• Passenger Information System.</li> <li>• Depot Management System.</li> <li>• Vehicle Scheduling &amp; Dispatch System.</li> <li>• Web Portal for ACTSL</li> <li>• Incident Management System.</li> <li>• Business Intelligence Software with ten user licenses.</li> <li>• CCTV surveillance System</li> <li>• Route Planner Mobile Application</li> </ul>

3. MSI shall be responsible for complete installation, integration, operations and maintenance of Transit Management System.
4. Integration with Card Host, Central Clearing House System and Smart Cards provided by Authority appointed Bank.
5. ASCL has concurrently initiated the process to appoint a Bank for implementation of Citywide Common Payment System for different Municipal and Recreation services and retail services. As part of CCPS Project, the Bank's scope and responsibilities include followings.
  - a. Card management
    - 1) Procurement of Smart cards
    - 2) Card issuance and Card personalization
    - 3) Card security
    - 4) Implementation of Card Host System
    - 5) Marketing and Distribution of Smart Cards by setting up of recharge, card issuance and Bills payment points across Allahabad City
    - 6) Mobile Recharge/ Payment wallet
  - b. Clearing House Solution.

- c. Cash Collection at all locations
  - d. Transaction Settlement at all places.
  - e. Setting up a Call Center.
6. The MSI shall interface/integrate with Card Host and Central Clearing House solution (CCHS) provided by ASCL's appointed vendor (i.e. BANK) for seamless integration with Card Host and Central Clearing House solution. The Bank shall provide required APIs and interfacing protocols to facilitate integration with Card Host and CCHS to the MSI.
  7. ASCL's appointed Bank shall undertake issuance of Smart Cards and card personalization task. The MSI shall have to provide necessary APIs and interfacing protocols for integration of smart cards with AFC System. The MSI can under no circumstances refuse to share such APIs/Protocols. Any such refusal shall be viewed seriously by the ASCL and shall be termed an Event of Default leading to Termination after due process.
  8. The functional requirements and technical specifications provided in this RFP are indicative and carry guiding rule. The MSI is free to offer products and solutions which meet requirements of the RFP focusing on the outcome, future scalability, security, reliability and adherence to specified SLA under this RFP, in line with applicable standards & best practices adopted in the industry. The MSI is encouraged to design an Optimized solution which is technically superior, innovative, proven, better in terms of functionality and is cost effective. Any specified parameters mentioned in the scope/technical requirement in the RFP may be considered if it is required for meeting current & future requirements during the contract period. The MSI is fully responsible for the specified outcome to be achieved.
  9. For more details on technical and functional specifications of Transit Management System, the MSI should refer to Annexure I for functional requirements and technical specifications.

#### **5.5.1.9. Design & Implementation of Smart Parking System**

The MSI shall be responsible for establishing the Smart Parking ICT and Non-ICT infrastructure for the Multi-Level Car Parking (MLCP) located near Big Bazar, Allahabad. It shall be the responsibility of the ASCL/AMC for operationalization of the MLCP and their optimal utilization for revenue generation. The capacity of the identified MLCP is 400 Equivalent Car Space (ECS).

The scope of the project for the Master System Integrator (MSI) shall be to:

1. Provide the infrastructure required for the Smart Parking system at the identified MLCP site (Ticket vending machines, Payment kiosks, parking sensors, Variable Messaging Displays, etc.)
2. Provide the hardware and software required for a centralized view of the parking lots
3. Provide the backhaul network which acts as communication layer for real time data from sensors to reach data center.
4. Provide a citizen interface (mobile app and web interface) for booking and guidance to parking lots and also provide this capability as service in the envisaged citizen app to be developed in near future by seamless integration

5. Integration with ICCC

- a. The centralized smart parking solution shall be integrated with the Integrated Command and Control Center (ICCC) and provide real-time statistics and data along with control to the operators and other stakeholders in the ICCC.
- b. The solution must integrate with e-Vahan/ National Vehicle Registration Database along with any other stolen vehicle database proposed in the future.
- c. The Smart Mobility Card which has been envisaged to be implemented under Transit Management System for city buses shall also be integrated with the smart parking system for providing a rich smart parking experience for the citizens and commuters.
- d. The parking solution also needs to be integrated with City Mobile apps / Smart payments system for allowing online slot reservations and payments.

The functional requirements and technical specifications provided in this RFP are indicative and carry guiding rule. The MSI is free to offer products and solutions which meet requirements of the RFP focusing on the outcome, future scalability, security, reliability and adherence to specified SLA under this RFP, in line with applicable standards & best practices adopted in the industry. The MSI is encouraged to design an Optimized solution which is technically superior, innovative, proven, better in terms of functionality and is cost effective. Any specified parameters mentioned in the scope/technical requirement in the RFP may be considered if it is required for meeting current & future requirements during the contract period. The MSI is fully responsible for the specified outcome to be achieved.

For more details on technical and functional specifications of Smart Parking System solution, the MSI should refer to Annexure I for functional requirements and technical specifications.

**5.5.1.10. Design & Implementation of Solid Waste Management System**

The scope of work for the MSI shall include supply, installation and implementation of Web based tracking and monitoring system with RFID, Surveillance System, and Attendance System, Weighbridge Monitoring and integration with existing GPS based VTS and other systems of AMC.

The MSI shall be responsible for design and implementation of following SWM system components:

- a. Door to Door Collection monitoring system for 1000 Bulk Generators through RFID Tags
- b. RFID Readers for 20 AMC Vehicles
- c. Vehicle Tracking & Monitoring system and integration with existing and to be procured (in future) GPS based Vehicle Tracking System devices for AMC Vehicles. The data feed access would be provided by AMC. Please refer to Annexure VIII for the specifications of existing GPS based Vehicle Tracking System (VTS) installed in AMC vehicles
- d. CCTV Surveillance System for Kudda Addas, Secondary Collection Centers, Vulnerable Garbage Points, SWM Plant etc.
- e. Weighbridge Monitoring: Electronic weighbridges shall be installed to measure the input being carried into by the incoming vehicles as well as to check the produced output after the

compost generation. The same shall be fed into the weighbridge software for processing data date wise, truck wise, shift wise, etc. The same shall be passed on to ICCC for day-to-day monitoring of waste treatment, disposal and compost generation and for generation of daily, weekly & monthly reports. The MSI shall also have to make a provision for inclusion of any additional weighbridges identified, in the future, to be monitored at the ICCC. The rates for weighbridge discovered as part of the ICCC RFP can be used for procurement of the additional weighbridges.

- f. Remote Biometric based Staff Attendance devices- 100 Nos
- g. Design & Integrate data feeds from SWM processing plant
- h. Geocoding / surveying of the following components shall be done by the MSI
  - i. Secondary Collection Centers
  - ii. Vulnerable Garbage points
  - iii. Processing sites
  - iv. Vehicle routes
  - v. Bin locations
  - vi. Departmental Offices
  - vii. Landfills/Dumping grounds
  - viii. Transfer stations
  - ix. Motor loading chowkies
  - x. Department workshops
  - xi. Ward offices
  - xii. Others (as per ASCL/AMC request)
  - xiii. The accuracy of these locations should be 3 to 5 meters. The MSI shall use these locations over the maps and shall deliver the same to ASCL/AMC in standard GIS format. ASCL/AMC already has initiated the process of procurement/development of GIS system where a GIS base map is in process of preparation. The Base Map shall be created from aerial photographs and updated from satellite images. The same shall be available as service once completed. The SWM solution should have integration with the GIS to use the base map. However the MSI shall use other Base Map services till the time GIS Base Map from ASCL/AMC is completely ready for use. Also the geo-coded locations mapped on the initial base map should be migrated by the MSI once the ASCL/AMC GIS Base Map is available. The migration should be completed in not more than 10 days from the day migration commences.
- i. Design, Development, Supply, and Deployment & Implementation of Web Based Application software integrated with GPS, RFID devices, weighbridge application, Existing GPS based



VTs, SWM processing site operation and Call Center Management and complaint management modules.

- j. The functional requirements and technical specifications provided in this RFP are indicative and carry guiding rule. The MSI is free to offer products and solutions which meet requirements of the RFP focusing on the outcome, future scalability, security, reliability and adherence to specified SLA under this RFP, in line with applicable standards & best practices adopted in the industry. The MSI is encouraged to design an Optimized solution which is technically superior, innovative, proven, better in terms of functionality and is cost effective. Any specified parameters mentioned in the scope/technical requirement in the RFP may be considered if it is required for meeting current & future requirements during the contract period. The MSI is fully responsible for the specified outcome to be achieved.
- k. For more details on technical and functional specifications of Solid Waste Management (SWM) solution, the MSI should refer to Annexure I for functional requirements and technical specifications.

#### **5.5.1.11. Geographical Information System (GIS)**

The scope of work for the MSI shall include utilization of GIS system at ASCL/AMC & integrate it with all the necessary components under ICCC. ASCL/AMC has already initiated the process of procurement/development of GIS system where a GIS base map is in process of preparation. The Base Map shall be created from aerial photographs and updated from satellite images. The same shall be available to MSI once developed/procured. It shall also be the scope of MSI to develop component specific GIS layers/utilities as & when requested by ASCL/AMC. The MSI shall also be responsible to ensure that the GIS datasets are updated at regular frequency based on nature of datasets to ensure accuracy during the course of the entire project.

The MSI is required to carry out the seamless integration to ensure ease of use of GIS in the Dashboards at ICCC. If this requires field survey, it needs to be done by MSI. If such a data is already available with city, it shall facilitate to provide the same. The MSI is required to update GIS maps from time to time.

The MSI shall be required to undertake a detailed assessment for integration of all the Field level ICT interventions proposed with the Geographical Information System (GIS). An indicative list of the GIS datasets that are relevant to ICCC operations and would be required to be collected from stakeholder/end users departments, field surveys and other ongoing projects is given below in the table:

S. No.	Systems/Departments	GIS Dataset
1.	Solid Waste Management	Garbage secondary collection points and Landfill in city
2.		Location of Community Bins



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S. No.	Systems/Departments	GIS Dataset
3.		Type of fleet vehicle
4.		Location of toilets
5.	Public Transport	Bus Routes on GIS Map
6.		Location of Bus Terminals
7.	Traffic and Police	Location of traffic lights
8.		Locations of existing surveillance cameras from Traffic and Police
9.		Location of police stations
10.	Electricity / Power	Location of Energy Assets (Sub-stations, Transmission network etc.)
11.		Location of the Energy Network on GIS map
12.	Gardens	Location of Parks/Gardens
13.		Amenities at the each Park/Garden
14.	Housing & Slums	Location of Slums
15.	Intelligent Poles	Location of Intelligent Poles
16.		Features on each Intelligent Pole
17.	Smart Parking	Location and number of Parking Slots
18.	Street Lights	Location of Street Lights

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S. No.	Systems/Departments	GIS Dataset
19.	Property Taxes	Properties on GIS map
20.	E-Governance	Population by each ward
21.		Location of important Government buildings
22.		Location of Tourist Attractions
23.		Location of Public Advertisement Boards
24.	Disaster Management	Location of highest Disaster Impact Areas in the city (Geofence)
25.	Emergency Management	Location of Fire Hydrants
26.		Location of fire stations
27.		Amenities at the each Fire Station
28.		Location of Health centers/Hospital
29.		Amenities at each Health Center/Hospital
30.		Type of fleet vehicle
31.	Water	Location of Water Assets
32.		Location of Water Network on GIS map
33.	Sewerage	Location of Sewerage Assets (STPs, ETPs etc.)
34.	Storm Water	Location of Storm Water drains

#### **5.5.1.12. Design & Implementation of Video Content Analytics (VCA) based Crowd Management System**

The MSI shall be responsible for designing, implementation and customization of Video Content Analytics (VCA) based Crowd Management system for 8 strategic locations of Kumbh Mela 2019 which are intended to record the people density at a particular time. This would include the installation of Fixed Box Cameras along with mounting infrastructure, custom application of VCA as per design and site requirements to achieve maximum accuracy levels and populating the output information as Dashboard for Crowd Management.

The MSI is expected to design and implement the solution as per below requirements and should not be limited to:

1. Real-Time Video Analysis for Crowd Management
2. Higher levels of accuracy of people count
3. Real-time detection and alert algorithm in overcrowding circumstances through thresholds and benchmarking
4. Identification of uni/bi-directional/Wrong-Way movements and movements in restricted areas
5. Dashboard for crowd management with graphical representation of crowd levels of the areas under coverage, trend analysis for peak and off-peak days, alerts for excessive crowds etc.

#### **5.5.1.13. Design & Implementation of Artificial Intelligence System with Edge Analytics**

The MSI shall be responsible for designing and implementing Artificial Intelligence System through various CCTV cameras, sensors etc. at the edge/field devices with continuous learning capabilities. Following listed use cases should be part of implementation and should not be limited to:

1. Graffiti and Vandalism detection
2. Debris and Garbage detection
3. Attendance of sanitation workers on site by face recognition
4. Sweeping and cleaning of streets/bins before and after
5. Garbage bin, cleaned or not
6. Litter detection
7. Tracking of garbage truck movement and Quantity of garbage dumped at dumpsite
8. Detection and Recognize the pattern of demonstration and conflicts in crowd
9. Detection and classification of human, animal and vehicle
10. Safety: Detection and classification based on:
  - a. Behavioral Biometry : Identification through multiple behavior
  - b. Parking violation

- c. Speeding vehicle
  - d. Accident detection
  - e. Loitering detection
  - f. Person climbing barricade
  - g. Person collapsing
  - h. Person/Face recognition
  - i. Gesture recognition : Identification through gesture change
11. 'Vehicle of interest' tracking by color, speed, number plate
  12. Helmet detection on two wheeler
  13. Unwanted/ banned vehicle detection
  14. Wrong way or illegal turn detection
  15. Toilet cleaning by detection of smell etc.
  16. Water quality sensors at District Metered Area level
  17. Environmental condition detection
  18. Air quality detection

These use cases shall be implemented using Artificial Intelligence through various cameras, sensors implemented in the field without dependency on any type of cameras, sensors (field device agnostic) with continuous learning capabilities.

The functional requirements and technical specifications provided in this RFP are indicative and carry guiding rule. The MSI is free to offer products and solutions which meet requirements of the RFP focusing on the outcome, future scalability, security, reliability and adherence to specified SLA under this RFP, in line with applicable standards & best practices adopted in the industry. The MSI is encouraged to design an Optimized solution which is technically superior, innovative, proven, better in terms of functionality and is cost effective. Any specified parameters mentioned in the scope/technical requirement in the RFP may be considered if it is required for meeting current & future requirements during the contract period. The MSI is fully responsible for the specified outcome to be achieved.

For more details on technical and functional specifications of Artificial Intelligence solution, the MSI should refer to Annexure I for functional requirements and technical specifications.

#### **5.5.2. Design, Supply, Installation and Commissioning of Network & Backbone Connectivity for ICCC & Kumbh Mela Surveillance system**

1. Network & Backbone Connectivity is an important components of the project and needs very careful attention in assessment, planning and implementation. It is important not only to ensure that the required connectivity is provisioned within the required timelines but also ensure that it is reliable, secure and supports the required SLA parameters of Latency, Jitter, Packet Loss and Performance.

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2. In order to meet the project requirements and SLA requirements as defined in this RFP, it has been decided that the MSI shall provision bandwidth/connectivity requirements as below:
  - a. For select/temporary locations, where field infrastructure would be operational during Kumbh Mela 2019 only, the MSI should consider the bandwidth/network connectivity requirements from field locations to Data Center/CCC/ICCC as defined in Annexure IX for 4 months from date of Go-Live
  - b. For remaining /permanent locations, where field infrastructure would be operational during the entire project duration, the MSI should consider the bandwidth/network connectivity requirements from field locations to Data Center/ICCC as defined in Annexure IX for 6 years from date of Go-Live
3. The MSI should provide a detailed network architecture of the overall system, incorporating findings of site survey exercise. The network so envisaged should be able to provide real time data streams to the Data Center, Viewing Centers, CCC and ICCC. All the components of the technical network architecture should be of industry best standard and assist MSI in ensuring that all the connectivity SLAs are adhered to during the operational phase.
4. The MSI shall also responsible for providing network connectivity for integration for below:
  - a. Between DC to Viewing Centers
  - b. Between CCC at Triveni Bandh to Viewing Centers
5. The MSI shall prepare the overall network connectivity plan for this project. The plan shall comprise of deployment of network equipment at the junctions/locations to be connected over network, any clearances required from other government departments for setting up of the entire network. The network architecture proposed should be scalable and in adherence to network security standards. Considering the timelines of Phase 1 implementation, it is necessary that at least 70% of the proposed last mile connectivity should be wired. However, within one year, all the wireless connectivity should be migrated to wired connectivity as per approval of ASCL. Last Mile to be defined as “the access link from the service provider’s PoP – (as per Telco Standards) to the field device”.
6. MSIs shall also required to do the estimation of bandwidth requirements considering following benchmark parameters and shall provide the details in the technical proposal.

#	ICCC System Components	Consideration
1	Adaptive Traffic Control System	<ul style="list-style-type: none"><li>As per designed solution requirements for real time data transmission</li></ul>
2	Variable Message Display	<ul style="list-style-type: none"><li>As per designed solution requirements for real</li></ul>

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	(VMD) Boards	time data transmission
3	Surveillance Cameras	<ul style="list-style-type: none"> <li>Resolution: 1920x1080</li> <li>Frame Rate: 25 fps</li> </ul>
4	ANPR Cameras	<ul style="list-style-type: none"> <li>Resolution: 1920x1080</li> <li>Frame Rate: 25 fps</li> </ul>
5	Environmental Sensors	<ul style="list-style-type: none"> <li>As per designed solution requirements for real time data transmission</li> </ul>
6	RLVD	<ul style="list-style-type: none"> <li>Video footage of incident (t-5 seconds to t+5 seconds, where t is time of incident) at required high resolution</li> <li>Minimum 4 Images of violating vehicle along with Number plate</li> </ul>
7	Smart Parking System	<ul style="list-style-type: none"> <li>As per designed solution requirements for real time data transmission</li> </ul>
8	RFID Readers & Attendance System devices for SWM	<ul style="list-style-type: none"> <li>As per designed solution requirements for real time data transmission</li> </ul>
9	Bus Surveillance, PIS, ETMs, GPS based VTS for Transit Management System	<ul style="list-style-type: none"> <li>As per designed solution requirements for real time data transmission</li> </ul>

7. The actual bandwidth requirement to cater the above mentioned bandwidth parameters and to meet SLAs would be calculated by the MSI and the same shall be clearly proposed in the technical proposal with detail calculations. ASCL also requires the MSI to meet the parameters of video feed quality, security & performance and thus MSIs should factor the same while designing the solution. ASCL reserves its right to ask the Master Systems Integrator to increase the bandwidth if the provided bandwidth is not sufficient to give the functionality of the system mentioned in the RFP and adhere to the SLAs.
8. In case the Telecommunication guidelines of Government of India require the purchaser to place Purchase Order to the Service Provider for bandwidth, ASCL shall do so. However, Master Systems Integrator shall sign a contract with Telecom Service Provider(s) and ensure the performance. ASCL shall make payments to the Master Systems Integrator.
9. The MSI shall be required to submit a detailed installation report post installation of all the equipment at approved locations. The report shall be utilized during the acceptance testing period of the project to verify the actual quantity of the equipment supplied and commissioned under the project.
10. The functional requirements and technical specifications provided in this RFP are indicative and carry guiding rule. The MSI is free to offer products and solutions which

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meet requirements of the RFP focusing on the outcome, future scalability, security, reliability and adherence to specified SLA under this RFP, in line with applicable standards & best practices adopted in the industry. The MSI is encouraged to design an Optimized solution which is technically superior, innovative, proven, better in terms of functionality and is cost effective. Any specified parameters mentioned in the scope/technical requirement in the RFP may be considered if it is required for meeting current & future requirements during the contract period. The MSI is fully responsible for the specified outcome to be achieved.

**5.5.3. Design, Supply, Installation and Commissioning of IT Infrastructure at Data Center (DC), Viewing Centers, CCC and ICCC**

1. MSI shall provide the IT hardware/software and Non-IT infrastructure at the following locations:

S. No.	Location Type	Location Name	Approximate Area	Indicative IT Infrastructure
1	Command & Control Center (CCC)	Kumbh Mela CCC, Triveni Bandh	2100 SFT	a. Video Wall, minimum size 55" in 4x3 matrix b. Operator Workstations: 20 Nos c. Simultaneous Viewing Capability: All live Cameras feeds coming at the Kumbh Mela CCC & 48 cameras from MCR CCC d. Contact Center Workstations: 30 Nos e. IP Phones: 50 Nos
2	Command & Control Center (CCC)	Modern Control Room, Police Lines	1900 SFT	a. Video Wall, minimum size 55" in 4x3 matrix b. Operator Workstations: 20 Nos c. IP Phones: 20 Nos d. Simultaneous Viewing Capability: All live Cameras feeds coming at the MCR CCC & 48 cameras from Kumbh Mela CCC
3	Data Center	Allahabad Municipal Corporation (AMC), Head	300 SFT	a. DC Infrastructure shall be co-located at ICCC b. Servers

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S. No.	Location Type	Location Name	Approximate Area	Indicative IT Infrastructure
		Office Campus, Civil Lines		c. Storage d. Network Switches e. Interim DC shall be established for temporary operations till the time ICCC building is operational
4	Integrated Command & Control Center (ICCC)	Allahabad Municipal Corporation (AMC), Head Office Campus, Civil Lines	10,000 SFT	a. Video Wall, minimum size 55" in 5x3 matrix b. Operator Workstations: 40 Nos c. IP Phones: 40 Nos d. Simultaneous Viewing Capability: All live Cameras feeds coming at the DC/ICCC
5	Temporary Viewing Center	Sangam Nose	Shall be informed during implementation phase	a. Display Monitor 55": 1 No. b. Operator Workstation: 1 No c. Simultaneous Viewing Capability: Any 16 Cameras out of total cameras assigned as per jurisdiction
6	Temporary Viewing Center	Arail Police Lines	Shall be informed during implementation phase	a. Display Monitor 55": 1 No. b. Operator Workstation: 1 No c. Simultaneous Viewing Capability: Any 16 Cameras out of total cameras assigned as per jurisdiction
7	Temporary Viewing Center	North Jhansi	Shall be informed during implementation phase	a. Display Monitor 55": 1 No. b. Operator Workstation: 1 No c. Simultaneous Viewing Capability: Any 16 Cameras out of total cameras assigned as per jurisdiction
8	Temporary Viewing Center	South Jhansi	Shall be informed during	a. Display Monitor 55": 1 No. b. Operator Workstation: 1 No



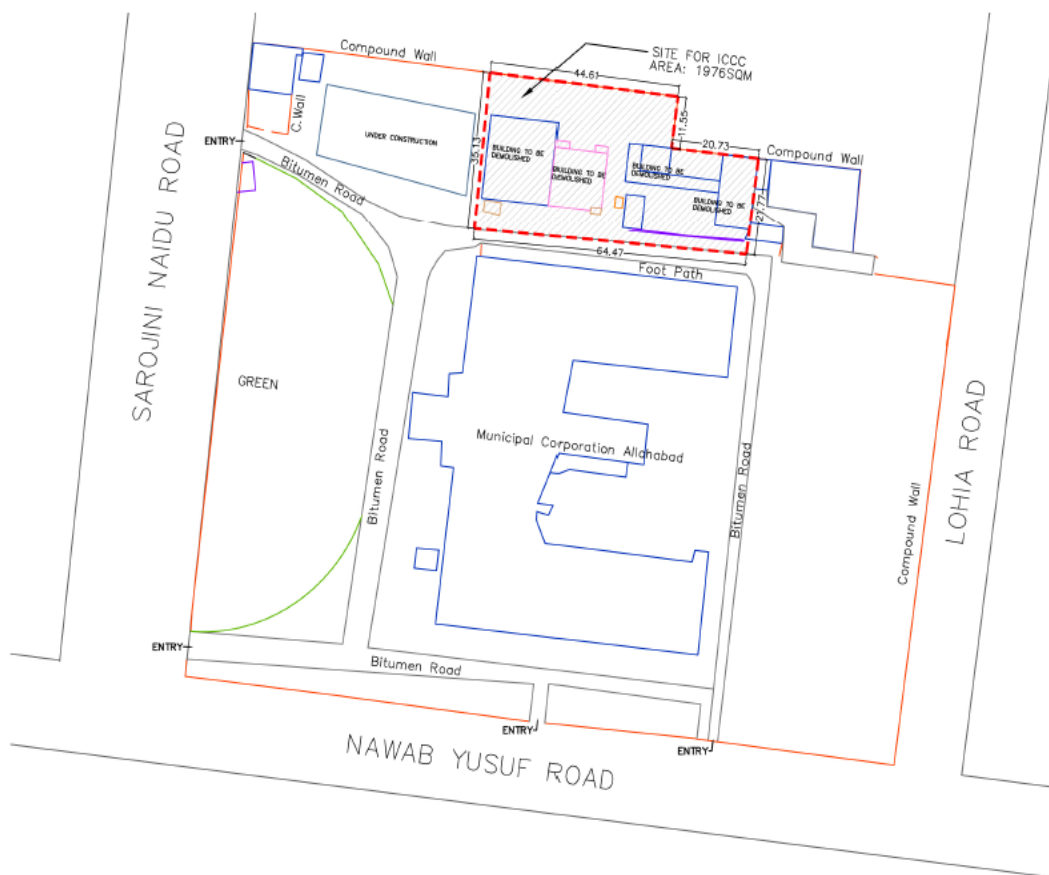
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S. No.	Location Type	Location Name	Approximate Area	Indicative IT Infrastructure
			implementation phase	c. Simultaneous Viewing Capability: Any 16 Cameras out of total cameras assigned as per jurisdiction

- The permanent Data Center shall be located at ICCC only. The building for ICCC shall be constructed. Till the time ICCC is operational, MSI is expected to establish CCCs as mentioned above at Triveni Bandh and Modern Control Room. Once the ICCC in Allahabad is operational, then the MSI shall migrate the partial/temporary infrastructure of Kumbh Mela CCC, Triveni Bandh as well as of Modern Control Room CCC to the ICCC. The site location for ICCC building is shown below:

**SITE FOR INTEGRATED COMMAND AND CONTROL CENTER (ICCC)**

1, Sarojini Naidu Marg, Civil Lines, Allahabad, Uttar Pradesh 211001



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3. Both, KMCCC & MCRCCC shall also be acting as viewing centers for each other with a viewing capacity of 48 cameras feeds at a given time simultaneously out of any of the total number of cameras installed in their respective regions and CCCs.
4. Post Kumbh Mela 2019, the partial/temporary infrastructure installed at MCR CCC shall be dismantled and migrated to ICCC once operational. Thereafter, MCR CCC shall act as a viewing center with a viewing capacity of 48 camera feeds at a given time simultaneously out of the total number cameras being monitored/managed at DC and ICCC
5. MSI has to ensure that redundancy is provided for all the key components to ensure that no single point of failure affects the performance of the overall system. It shall be MSI's responsibility to:
  - a. Supply, Install and Commission of IT Infrastructure including site preparation in Interim DC, DC, CCCs and ICCC
  - b. Supply viewing screen, workstations, IP Phones, network switch, and required accessories including furniture at the viewing centers. The IT infrastructure of temporary viewing centers shall be migrated to ICCC.
  - c. Establish LAN and WAN connectivity at DC, CCCs, ICCC and Viewing Centers
6. Data Center should provide a dedicated rack space for the ICCC Infrastructure.
7. Data Center developed by MSI should be as per Telecommunications Infrastructure Standard for Data Centers
8. Access to the Data Center Space where the ICCC Infrastructure is hosted should be demarcated and physical access to the place would be given only to the authorized personnel including Networking & Security Infrastructure and other associated ICT Components.
9. The MSI shall provide system integration services to customize and integrate the applications procured through the project. The ICCC system applications proposed by the MSI should have open APIs and should be able to integrate and share the data with other third party systems already available or coming up in the near future
10. As part of preparing the final bill of material for the physical data center, the successful MSI shall be required to list all passive & active components required in the data centers.
11. The bill of material proposed by the successful MSI shall be approved by ASCL for its supply and installation. Indicative IT Infrastructure to be commissioned as part of the ICCC project at Data Center/CCCs/ICCC are as under:
  - a. Servers (inclusive of OS) - Application Servers, Database Server, Video Recording Server, Video Management Server, Enterprise Backup Server, Domain Controller, Failover Servers for application and Recording Servers

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- b. Application & System Software (with necessary customization) – Adaptive Traffic Control System application, Video Management System application, ANPR application, Red Light Violation Detection application, Variable Message Display application, E-Challan application, Passenger Information System (PIS) management application, AVLS application, Depot Management System, business intelligence application, Command & Control Center Application, Enterprise Management System application etc.
  - c. RDBMS (if required)
  - d. Anti-virus Software
  - e. Storage Solution
  - f. Storage Management Solution
  - g. Core Router
  - h. Switches (L2 & L3 Switches)
  - i. KVM Switches
  - j. Firewall
  - k. IP Phones
  - l. Racks
  - m. All required Passive Components
  - n. Any other item required to the cater to the scope of work mentioned in this
12. The bidder is expected to calculate and design the IT Infrastructure requirements including compute, storage and video management software licenses etc. required for real-time monitoring, recording and integration of ONVIF Compliant IP CCTV (PTZ and Fixed Box) Cameras to be provided by M/s Reliance Jio. The supply, installation and connectivity till CCCs/ICCC of the provided cameras shall be in Reliance Jio's scope. MSI is expected to capture and propose the IT Infrastructure for successful operations and integrations of the same. The following table provides the details of proposed cameras:

S. No.	No. of Locations	Approximate No. of Cameras	Remarks
1	47 Nos.	188 Nos	Permanent infrastructure for City Area

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S. No.	No. of Locations	Approximate No. of Cameras	Remarks
2	25 Nos.	25 Nos	Temporary infrastructure for Kumbh Mela Area

13. The requirements mentioned are only indicative requirements of IT & Non-IT Infrastructure requirements at DC/CCCs/ICCC. The exact quantity and requirement shall be proposed as part of the technical proposal of the MSI.
14. The MSI shall prepare the overall data center establishment & its operational plan for this project. The plan shall comprise of deployment of all the equipment required under the project. The implementation roll-out plan for setting up the data center shall be approved by ASCL. The detailed plan shall be also comprise of the scalability, expandability and security that such data center shall implement under this project.
15. The MSI shall establish a state of the art CCC, ICCC and viewing centers, the key components for the same shall be as follows:
  - a. Video Wall system
  - b. Operator workstations
  - c. IP Phones
  - d. Active Networking Components (Switches, Routers)
  - e. Passive Networking Components
  - f. Electrical Cabling and Necessary LED Illumination Devices
  - g. Office Workstations
  - h. UPS
16. The MSI shall be required to submit a detailed installation report post installation of all the equipment at approved locations. The report shall be utilized during the acceptance testing period of the project to verify the actual quantity of the equipment supplied and commissioned under the project.
17. The functional requirements and technical specifications provided in this RFP are indicative and carry guiding rule. The MSI is free to offer products and solutions which meet requirements of the RFP focusing on the outcome, future scalability, security, reliability and adherence to specified SLA under this RFP, in line with applicable standards & best practices adopted in the industry. The MSI is encouraged to design an Optimized solution which is technically superior, innovative, proven, better in terms of functionality and is cost effective. Any specified parameters mentioned in the scope/technical requirement in the RFP may be considered if it is required for meeting

current & future requirements during the contract period. The MSI is fully responsible for the specified outcome to be achieved.

**5.5.4. Design and Implementation of Disaster Recovery Infrastructure for ICCC project**

1. MSI shall propose to host Applications and storage on cloud for complete Data Recovery (DR) operations. Applications should fail-over to the cloud in case of DR. The MSI should design the DR according to RTO/RPO as mentioned below and consider active/active and active/passive.

Recovery Point Objective (RPO)	4 Hours
Recovery Time Objective (RTO)	1 Hour

2. DR shall be implemented based on managed cloud services and shall adhere to guideline issued by MeitY over time to time. SLA for DR shall be as per MeitY guideline.
3. MSI may propose the Cloud Service Provider from the empaneled vendors of Deity.
4. Below are the key factors to be considered for cloud hosting -
  - a. The MSI is required to prepare and submit along with their technical proposal, the details of methodologies and computations for sizing and capacity of storage, compute, backup, network and security.
  - b. There should be logical separation (of space, servers, storage, network infrastructure and networks) to protect data, applications and servers on Private cloud.
  - c. It is expected that bidder shall make all necessary provision to ensure high availability at the Data Center and after switch over to the DR; it gets back in to normal operations from the DC as soon as possible. However, the overall disaster Recovery Solution should be provisioned in such a manner that previous 7 days feeds are available and it should be able to run for 7 Days in case of Disaster.
  - d. One full-scale DR drill to be conducted during UAT & post go-live and additional DR Drills on half yearly basis shall be conducted.
  - e. The system shall be hosted in the site identified by the MSI and as agreed by the ASCL for DR (backup only).
  - f. There should be sufficient capacity (compute, network and storage capacity offered) available for near real time provisioning (as per the SLA requirement of the ASCL) during any unanticipated spikes in the user load.
  - g. DR site shall be located in India only.

- h. Ensure redundancy at each level
- i. MSI shall provide interoperability support with regards to available APIs, data portability etc. for the ASCL to utilize in case of Change of cloud service provider, migration back to in-house infrastructure, burst to a different cloud service provider for a short duration or availing backup or DR services from a different service provider.
- j. The MSI is fully responsible for tech refreshes, patch management and other operations of infrastructure that is in the scope of the MSI.
- k. ASCL retains ownership of all virtual machines, templates, clones, and scripts/applications created for the ASCL's application. ASCL retains the right to request (or should be able to retrieve) full copies of these virtual machines at any time
- l. Provide a robust, fault tolerant infrastructure with enterprise grade SLAs with an assured uptime of 99.999%, SLA measured at the VM Level & SLA measured at the Storage Levels
- m. Cloud services should be accessible via internet and MPLS.
- n. Required Support to be provided to the ASCL in migration of the VMs, data, content and any other assets to the new environment created by the ASCL or any Agency (on behalf of the ASCL) on alternate cloud service provider's offerings to enable successful deployment and running of the ASCL's solution on the new infrastructure.
- o. The MSI should configure, schedule and manage backups of all the data including but not limited to files, folders, images, system state, databases and enterprise applications
  - Perform and store data and file backups consisting of an initial full back up with daily incremental backups for files;
  - For the files, perform weekly backups;
  - For the databases, perform a twice weekly full database backup, with a three times daily backup of database log files
  - Encryption of all backup files and data and management of encryption keys as a service that can be enabled for Government Departments that require such a service.
  - Retain database backups for thirty (30) days
- p. The MSI should offer dashboard to provide visibility into service via dashboard.
- q. MSI shall not delete any data at the end of the agreement (for a maximum of 45 days beyond the expiry of the Agreement) without the express approval of the ASCL.

#### **Preparation of Disaster Recovery Operational Plan**

The MSI should provide detailed operating procedures for each application during the

following scenarios. These shall be mutually agreed upon with ASCL during the project kick off.

- a. Business as usual: the primary site is functioning as required, procedures for ensuring consistency of data availability at secondary (DR) site.
- b. Disaster: Declaration of disaster, making the DR site live for production, ensuring availability of users to the secondary site.
- c. Operations from DR site: Ensuring secondary site is addressing the functionality as desired

### **Configure proposed solution for usage**

The service provider shall provide DR Management Solution to ASCL meeting following specifications:

#	Features
1	The proposed solution must offer a workflow based management & monitoring and reporting capability for the real time monitoring of a DR solution parameters like RPO (at DB level), RTO, replication status and should provide alerts( including SMS and e-mail alerts) on any deviations. The proposed solution should be able to conduct DR Drills from a centralized location
2	The proposed solution should provide a single dashboard to track DR Readiness status of all the applications under DR
3	The proposed solution should be capable of reporting important health parameters like disk space, password changes, file addition/deletion etc. to ensure DR readiness
4	The proposed solution should have inbuilt ready to use library of recovery automation action for heterogeneous databases and replication environment. This must significantly reduce custom development of scripts and speedy deployment of DR solutions
5	The proposed solution should facilitate out-of-the-box, workflow based switchover and switchback for DR drills for standard applications based on industry best practices
6	The proposed solution should facilitate workflows for bringing up the applications and all the components it depends on at DR while it is up at primary site without pausing/stopping the replication
7	The proposed solution should be able to manage hosts by either deploying agents or without deploying any agent and should not require any change in the existing environment

#	Features
8	The proposed solution must support all major platforms including Linux, Windows, Solaris, Unix etc. with high availability options. It must support both physical and virtual platforms
9	The proposed solution should facilitate workflow based, single-click recovery mechanism for single or multiple applications
10	The proposed DRM solution should integrate seamlessly with the existing setup without the need to reconfigure or remove existing application setup including clusters
11	The proposed solution should cover all the functionalities mentioned in the specifications and all the required licenses should be provisioned

#### **Periodic Disaster Recovery Plan Update**

The service provider shall be responsible for –

- a. Devising and documenting the DR policy discussed and approved by ASCL.
- b. Providing data storage mechanism from the Go-Live date till the date of contract expiry for the purpose of compliance and audit

The functional requirements and technical specifications provided in this RFP are indicative and carry guiding rule. The MSI is free to offer products and solutions which meet requirements of the RFP focusing on the outcome, future scalability, security, reliability and adherence to specified SLA under this RFP, in line with applicable standards & best practices adopted in the industry. The MSI is encouraged to design an Optimized solution which is technically superior, innovative, proven, better in terms of functionality and is cost effective. Any specified parameters mentioned in the scope/technical requirement in the RFP may be considered if it is required for meeting current & future requirements during the contract period. The MSI is fully responsible for the specified outcome to be achieved.

#### **5.6. Dismantling, transportation and re-installation of Infrastructure**

The MSI shall be responsible for dismantling the temporary infrastructure of both field locations, viewing centers and CCCs for Kumbh Mela 2019, transportation to the site identified by client or its designated agencies and re-installation at other identified sites covered under Pan City. The MSI shall be expected to share a strategy for execution of dismantling works and their reinstallation with minimum damage as part of their approach and methodology document submitted in technical bid. The indicative locations for both temporary and permanent locations are provided in Annexure IX of this document.

#### **5.7. Responsibility Matrix**



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#	Key Activities	MSI	AMC	ASCL	Network Vendors	Electricity Providers	Other Utilities	Other Departments	PMC	Existing ICT Vendors at ASCL
<b>Project Inception Phase</b>										
1	Project Kick Off	R/A	C	C	I	I	I	I	C	I
2	Deployment of manpower	R/A	C	C	I	I	I	I	C	I
<b>Requirement Phase</b>										
3	Assess the requirement of IT Infrastructure and Non IT Infrastructure	R/A	C	C	C	C	C	C	C	C
4	Assessment of Business processes	R/A	C	C	I	I	I	C	C	I
5	Assessment of requirement of Software requirements	R/A	C	C	I	I	I	C	C	I
6	Assess the Integration requirement	R/A	C	C	C	C	I	C	C	C
7	Assess the connectivity requirement all locations (including Building)	R/A	C	C	C	I	I	C	C	I
8	Assessment the Network laying requirement	C	C	C	R/A	I	I	C	C	I
9	Assessment of training requirement	R/A	C	C	I	I	I	C	C	I
<b>Design Phase</b>										
10	Develop the Concept of Operations (CONOPS)	R/A	C	C	C	I	I	C	C	I
11	Formulation of Solution Architecture	R/A	C	C	C	I	I	C	C	I
12	Creation of Detail Drawing	R/A	C	C	C	I	I	C	C	I
13	Detailed Design of Smart City Solutions	R/A	C	C	C	I	I	C	C	I
14	Development of test cases (Unit, System Integration and User Acceptance)	R/A	C	C	C	I	I	C	C	I

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#	Key Activities	MSI	AMC	ASCL	Network Vendors	Electricity Providers	Other Utilities	Other Departments	PMC	Existing ICT Vendors at ASCL
15	Preparation of final bill of quantity and material	R/A	C	C	C	C	I	C	C	I
16	SoP preparation	R/A	C	C	C	C	C	C	C	I
<b>Development Phase</b>										
17	Helpdesk setup	R/A	C	C	I	I	I	I	C	I
18	Physical Infrastructure setup	R/A	C	C	I	I	I	I	C	I
19	Procurement of Equipment , edge devices, COTS software (if any), Licenses	R/A	C	C	I	I	I	I	C	I
20	IT and Non IT Infrastructure Installation	R/A	C	C	I	I	I	I	C	I
21	Development, Testing and Production environment setup	R/A	C	C	I	I	I	I	C	I
22	Software Application customization (if any)	R/A	C	C	I	I	I	I	C	I
23	Development of Bespoke Solution (if any)	R/A	C	C	I	I	I	I	C	I
24	Data Migration	R/A	C	C	I	I	I	I	C	I
25	Integration with Third party services/application (if any)	R/A	C	C	I	I	I	I	C	I
26	Unit and User Acceptance Testing	R/A	C	C	I	I	I	I	C	I
27	Implementation of Solutions	R/A	C	C	I	I	I	I	C	I
28	Preparation of User Manuals , training curriculum and training materials	R/A	C	C	I	I	I	I	C	I
29	Role based training(s) on the Smart City Solutions	R/A	C	C	I	I	I	I	C	I

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#	Key Activities	MSI	AMC	ASCL	Network Vendors	Electricity Providers	Other Utilities	Other Departments	PMC	Existing ICT Vendors at ASCL
<b>Integration Phase</b>										
30	SoP implementation	R/A	C	C	C	C	C	C	C	I
31	Integration with GIS	R/A	C	C	C	C	C	C	C	I
32	Integration of solutions with Command and Control Center	R/A	C	C	C	C	C	C	C	I
<b>Go -Live</b>										
33	Go Live	R/A	C	C	I	I	I	I	C	I
<b>Operation and Maintenance</b>										
34	Operation and Maintenance of IT, Non IT infrastructure and Applications	R/A	C	C	I	I	I	I	C	I
35	SLA and Performance Monitoring	R/A	C	C	I	I	I	I	C	I
36	Logging, tracking and resolution of issues.	R/A	C	C	I	I	I	I	C	I
37	Application enhancement	R/A	C	C	I	I	I	I	C	I
38	Patch & Version Updates	R/A	C	C	I	I	I	I	C	I
39	Helpdesk services	R/A	C	C	I	I	I	I	C	I

**Note:** All decisions shall be taken by ASCL which shall be abided by all the stakeholders in the above matrix.

R/A = Responsible/Accountable

C = Consulted

I = Informed

## 5.8. Project Deliverables

#	Key Activities	Deliverables
1	Project Kick Off	1. Project Plan
2	Deployment of manpower	2. Risk Management and Mitigation Plan

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#	Key Activities	Deliverables
3	Assess the requirement of IT Infrastructure and Non IT Infrastructure	1. CONOPS document 2. Functional Requirement Specification document 3. System Requirement Specification document 4. Requirements Traceability Matrix 5. Site Survey Report
4	Assessment of Business processes	
5	Assessment of requirement of Software requirements	
6	Assess the Integration requirement	
7	Assess the connectivity requirement of all locations (including Building)	
8	Assessment of network laying requirement	
9	Assessment of training requirement	
10	Formulation of Solution Architecture	1. Final Bill of Quantity 2. HLD documents 3. LLD documents 4. Application architecture documents. 5. Technical Architecture documents. 6. Network Architecture documents. 7. ER diagrams and other data modeling documents. 8. Logical and physical database design. 9. Data dictionary and data definitions. 10. GUI design (screen design, navigation, etc.). 11. Test Plans 12. SoPs 13. Change management Plan
11	Creation of Detail Drawing	
12	Detailed Design of Smart City Solutions	
13	Development of test cases (Unit, System Integration and User Acceptance)	
14	Preparation of final bill of quantity and material	
15	SoP preparation	
16	Helpdesk setup	
17	Physical Infrastructure setup	1. IT and Non IT Infrastructure Installation Report 2. Completion of UAT and closure of observations report 3. Training Completion report 4. Application deployment and configuration report
18	Procurement of Equipment , edge devices, COTS software (if any), Licenses	
19	IT and Non IT Infrastructure Installation	
20	Development, Testing and Production environment setup	
21	Software Application customization (if any)	
22	Development of Bespoke Solution (if any)	
23	Data Migration	

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#	Key Activities	Deliverables
24	Integration with Third party services/application (if any)	
25	Unit and User Acceptance Testing	
26	Implementation of Solutions	
27	Preparation of User Manuals , training curriculum and training materials	
28	Role based training(s) on the Smart City Solutions	
29	SoP implementation	1. Integration Testing Report
30	Integration with Smart Components	
31	Integration of solutions with Command and Control Center	
32	Go Live	1. Go-Live Report
33	Operation and Maintenance of IT, Non IT infrastructure and Applications	1. Detailed plan for monitoring of SLAs and performance of the overall system 2. Fortnightly Progress Report 3. Monthly SLA Monitoring Report and Exception Report 4. Quarterly security Report 5. Issues logging and resolution report
34	SLA and Performance Monitoring	
35	Logging, tracking and resolution of issues.	
36	Application enhancement	
37	Patch & Version Updates	
38	Helpdesk services	

**5.9. Project Timelines**

Services	Approximate Time for Issuance of Request Order	Tentative Scope/ Approximate Sizing	Go-Live/ Completion Date
Request Order 1	One week post issue of LOI/ completion of site survey activity	<ol style="list-style-type: none"> <li>1. KM CCC &amp; MCR CCC - IT hardware</li> <li>2. KM CCC &amp; MCR CCC - Non-IT equipment</li> <li>3. KM CCC &amp; MCR CCC – software</li> <li>4. Data Center (DC) – Hardware</li> <li>5. Data Center (DC) – Software</li> <li>6. Data Center (DC)– Non-IT equipment</li> <li>7. Temporary Viewing Centers- IT/ Non-IT Infrastructure- 4 Locations</li> <li>8. Implementation and Integration of City Surveillance System – 276 Traffic Junctions/Locations</li> </ol>	31 <sup>st</sup> October 2018

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Services	Approximate Time for Issuance of Request Order	Tentative Scope/ Approximate Sizing	Go-Live/ Completion Date
		9. Implementation and Integration of Adaptive Traffic Control System (ATCS) – 17 Traffic Junctions/Locations 10. Implementation and Integration of Variable Message Display (VMD) Boards – 40 Traffic Junctions/Locations 11. Implementation and Integration of Solid Waste Management (SWM) System including CCTV Surveillance Cameras for 48 Kudda Addas	
Request Order 2	Post Go-Live of Request Order 1	1. Dismantling, transportation and Reinstallation- Partial Infrastructure of KM CCC, MCR CCC, DC & Viewing Centers- IT Hardware/Software & Non-IT equipment 2. ICCC- IT hardware 3. ICCC- Non-IT equipment 4. ICCC – software 5. Augmentation of Data Center (DC) – Hardware 6. Augmentation of Data Center (DC) – Software 7. Augmentation of Data Center (DC)– non-IT equipment 8. Disaster Recovery (DR) services 9. Implementation and Integration of City Surveillance System – 94 Traffic Junctions/Locations 10. Implementation and Integration of Adaptive Traffic Control System (ATCS) – 26 Traffic Junctions/Locations 11. Dismantling, transportation and Reinstallation of Variable Message Display (VMD) Boards – 31 Traffic Junctions/Locations 12. Implementation and Integration of RLVD Systems– 18 Traffic Junctions/Locations 13. Implementation and Integration of Solid Waste Management (SWM) System including CCTV	Commencement Date: 1st April 2019 & Go-Live Date is 31 <sup>st</sup> December 2019

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<b>Services</b>	<b>Approximate Time for Issuance of Request Order</b>	<b>Tentative Scope/ Approximate Sizing</b>	<b>Go-Live/ Completion Date</b>
		<p>Surveillance System for 50 Vulnerable Garbage Points</p> <p>14. Implementation and Integration of Transit Management System for 250 City Buses</p> <p>15. Implementation and Integration of Environmental Sensors- 28 Locations</p> <p>16. Implementation and Integration of Smart Parking System – 1 MLCP</p> <p>17. Integration with GIS (Sub- System)</p> <p>18. Integration with Smart Governance (New Modules, Sub- System)</p> <p>19. Integration with e-Health System</p> <p>20. Integration with e-Education System</p> <p>21. Integration with Smart Street Lighting system</p> <p>22. Integration with Smart Parking (New System and Sensors Only)</p>	
Request Order 3	Post Go-Live of Request Order 2	<p>1. Integration with Power SCADA</p> <p>2. Integration with Sewage SCADA</p> <p>3. Integration with Water SCADA</p> <p>4. Other integrations as per requirements</p>	28 <sup>th</sup> February 2020

## **6. Annexure I- Functional Requirements & Technical Specifications**

The functional requirements and technical specifications provided in the below sections and at other sections in this RFP are indicative and carry guiding rule. The MSI is free to offer products and solutions which meet requirements of the RFP focusing on the outcome, future scalability, security, reliability and adherence to specified SLA under this RFP, in line with applicable standards & best practices adopted in the industry. The MSI is encouraged to design an Optimized solution which is technically superior, innovative, proven, better in terms of functionality and is cost effective. Any specified parameters mentioned in the scope/technical requirement in the RFP may be considered if it is required for meeting current & future requirements during the contract period. The MSI is fully responsible for the specified outcome to be achieved.

### **6.1. Adaptive Traffic Control System (ATCS)**

#### **6.1.1. Functional Requirement - Adaptive Traffic Control System (ATCS)**

#	Building Blocks	Bidder Compliance(Yes/No)
1	Traffic Signal Controller	
2	Vehicle Detectors	
3	Communication Network	
4	Software Application	

##### **6.1.1.1. Functional Requirement -Traffic Signal Controller**

#	Minimum Specifications	Bidder Compliance(Yes/No)	Product Documentation Reference
1	<b>Make</b>	<to be provided by the bidder>	
2	<b>Model</b>	<to be provided by the bidder>	
3	The Traffic Signal Controller equipment should be 32 bit or 64 bit microcontroller with solid state traffic signal lamp switching module with the ability to program any combination of traffic signal stages, phases and junction groups. The controller shall preferably have a conflict monitoring facility to ensure that conflicting phases, dangerous are pre-flagged at the programming stage and these are disallowed even during manual override phase.		
4	The Traffic Signal Controller shall be adaptive so that it can be controlled through the central traffic control center as an individual junction or as part		



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#	Minimum Specifications	Bidder Compliance( Yes/No)	Product Documentation Reference
	of group of traffic junctions along a corridor or a region. The signal controller design shall be flexible for the junction such that it can be easily configured to be part of any corridor or group definition and can be changed through central command controller easily		
5	Site specific configuration data shall be stored in a non-volatile memory device (FLASH memory) easily programmable at the site through keypad or laptop. A minimum of 512KB flash memory and 128KB RAM shall be provided. Volatile memory shall not be used for storing the junction specific plans or signal timings.		
6	All timings generated within a traffic signal controller shall be digitally derived from a crystal clock which shall be accurate to plus or minus 100 milliseconds.		
7	The controller shall provide a real time clock (RTC) with battery backup that set and update the time, date and day of the week from the GPS. The RTC shall have minimum of 10 years battery backup.		
8	The controller shall have the facility to update the RTC time from ATCS server, GPS and through manual entry.		
9	The traffic signal system including controller shall have provision for audio output tones and should be disabled friendly.		
10	The controller shall be capable of communicating with the ATCS server through Ethernet on a managed leased line network or any other appropriate stable communication network.		

**A) Police Panel**

The controller shall provide the following facilities in a separate panel with provision for lock and key arrangements for use by the Traffic Police.

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#	Minimum Specifications	Bidder Compliance( Yes/No)	Product Documentation Reference
1	Four Hurry Call switches: The Hurry Call mode shall provide the means to force the controller to a defined stage, without violating safety clearances. A preemption input may be used to demand the Hurry Call mode to give right of way to emergency vehicles. It should be possible to configure the Hurry Call switches to any stage as per site requirements.		
2	One Forced Flash Switch: Activation of this switch should force the signal to Flashing Amber / Flashing Red.		
3	One Auto / Manual Switch: Activation of this switch should enable manual operation of the controller. Deactivation of the manual switch shall continue from the current stage without interruption.		
4	One Manual Advance Pushbutton Switch: In manual operation mode, the stages appear in the sequence specified in the signal plan timetable. Activating the pushbutton switch shall terminate the currently running stage and start the next, without violating safety clearances.		
5	One Junction OFF Switch: Activating this switch should put OFF all signal lamps. On deactivation of the switch the traffic signal controller shall resume its normal operation without violating any safety clearances.		

**B) Modes of Operation**

The traffic signal controller shall have the following modes of operation:

#	Minimum Specifications	Bidder Compliance( Yes/No)	Product Documentation Reference
1	Fixed Time: In fixed time (pre-timed) mode the traffic signal controller shall execute stage timings according to the site specific timetable maintained in the traffic signal controller FLASH memory. Inputs from vehicle detectors shall be ignored in this mode and no preemption shall be made on		

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#	Minimum Specifications	Bidder Compliance( Yes/No)	Product Documentation Reference
	any stage. Cycle time shall remain constant in every cycle execution for a given time period.		
2	Vehicle Actuation with All Stages Preemption: In the vehicle actuation with all stages preemption mode, the traffic signal controller shall execute stage timings as per demand from vehicle detectors within the constraints of Minimum Green, Maximum Green running period for the stage and Cycle time stored in the traffic signal controller FLASH memory. Preemption shall be possible for all demand actuated stages. Cycle time may vary in every cycle execution.		
3	Semi-Actuation: In the semi-actuation mode, the traffic signal controller shall execute stage timings in the vehicle actuated stages as per demand from vehicle detectors within the constraints of Minimum Green, Maximum Green running period for the stage and Cycle time stored in the traffic signal controller FLASH memory. All other stages shall execute the Maximum green time configured for the stage. Preemption shall be possible for all demand actuated stages. Cycle time may vary in every cycle execution.		
4	Stage Skipping: The traffic signal controller shall not execute the stage enabled for skipping when there is no vehicle demand registered for the stage till clearance amber time of the previous stage.		
5	Transit Signal Priority (TSP) for BRT/ACTSL (as applicable) buses: The traffic signal controller shall provide transit signal priority for buses in dedicated lane to ensure minimum stop delay at the intersection, without violating safety clearances.		
6	Vehicle Actuation with Fixed Cycle length: In vehicle actuation with fixed cycle length mode, the traffic signal controller shall execute stage timings as per demand from vehicle detectors within the constraints of Minimum Green, Maximum Green		

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#	Minimum Specifications	Bidder Compliance( Yes/No)	Product Documentation Reference
	running period for the stage and Cycle time shall be maintained constant during a given timeslot. Preemption for all demand actuated stages except for Priority Stage shall be possible.		
7	<p>Full ATCS (FATCS): In FATCS mode, the traffic signal controller shall execute stage timings as per demand within the constraints of Minimum Green, Maximum Green running period for the stage and Cycle time specified by the Central Computer during every cycle switching. Preemption for all demand actuated stages except Priority Stage shall be possible in this mode. The traffic signal controller shall identify a communication failure with the central computer within a specified time period. In such an event the signal plan timings shall be executed from the local timetable stored in the traffic signal controller FLASH memory. Fallback mode of the traffic signal controller shall be vehicle actuated. On restoration of the communication with central computer the traffic signal controller shall automatically resort to FATCS mode.</p> <p>The traffic signal controller shall accept commands for remote selection / de-selection of the following from the Central Computer at CCCs/ICCC.</p> <p>Hurry Call</p> <p>Flashing Amber / Flashing Red</p> <p>Junction Off</p> <p>If not reverted to the normal operation within the time period listed below, the traffic signal controllers shall timeout the commands and operate normally</p> <p>Hurry Call – 5 Minutes</p> <p>Flashing Amber / Flashing Red – 30 Minutes</p> <p>Junction Off – 30 Minutes</p>		

#	Minimum Specifications	Bidder Compliance( Yes/No)	Product Documentation Reference
	<p>The traffic signal controller shall report the following to the Central Computer through the communication network every cycle or on an event as appropriate.</p> <p>Green time actually exercised for each approach (stage preemption timing) against the Green running period set for the approach by the Central Computer</p> <p>Mode of Operation</p> <p>Lamp failure, if any</p> <p>Output short circuit, if any</p> <p>Detector failure, if any</p>		

### **C) Traffic Signal Controller Operating Parameters**

Phases - The controller shall preferably have facility to configure 32 Phases either for vehicular movement, filter green, indicative green, pedestrian movement or a combination thereof.

#	Minimum Specifications	Bidder Compliance( Yes/No)	Product Documentation Reference
1	It shall be possible to operate the filter green (turning right signal) along with a vehicular phase. The filter green signal shall flash for a time period equal to the clearance amber period at timeout when operated with a vehicular phase.		
2	The pedestrian phase signal shall be configured for flashing red or flashing green aspect during pedestrian clearance.		
3	It shall be possible to configure any phase to the given lamp numbers at the site.		
4	Stages – The controller shall have facility to configure 32 Stages		
5	Cycle Plans – The controller shall have facility to configure 24 Cycle Plans and the Amber Flashing / Red Flashing plan. It shall be possible to define different stage switching sequences in different		

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#	Minimum Specifications	Bidder Compliance( Yes/No)	Product Documentation Reference
	cycle plans. The controller shall have the capability for a minimum of 32 cycle-switching per day in fixed mode of operation.		
6	Day Plans – The controller shall have facility to configure each day of the week with different day plans. It shall also be possible to set any of the day plans to any day of the week. The controller shall have the capability to configure 20 day plans.		
7	Special Day Plans – The controller shall have facility to configure a minimum of 20 days as special days in a calendar year.		
8	Starting Amber – During power up the controller shall initially execute the Flashing Amber / Flashing Red plan for a time period of 3 Seconds to 10 Seconds. The default value of this Starting Amber is 5 Seconds. Facility shall be available to configure the time period of Starting Amber within the given limits at the site.		
9	Inter-green – Normally the inter-green period formed by the clearance Amber and Red extension period shall be common for all stages. However, the controller shall have a facility to program individual inter-green period from 3 Seconds to 10 Seconds.		
10	Minimum Green – The controller shall allow programming the minimum Green period from 5 Seconds to 10 Seconds without violating the safety clearances. It should not be possible to preempt the Minimum Green once the stage start commencing execution.		
11	All Red – Immediately after the Starting Amber all the approaches should be given red signal for a few seconds before allowing any right of way, as a safety measure. The controller shall have programmability of 3 Seconds to 10 Seconds for All Red signal.		

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#	Minimum Specifications	Bidder Compliance( Yes/No)	Product Documentation Reference
12	Signal lamps monitoring – The controller shall have inbuilt circuitry to monitor the lamp status		
13	Green – Green Conflict Monitoring – The controller shall have a facility to list all conflicting phases at an intersection. The controller should not allow programming of these conflicting phases in a Stage. A hardware failure leading to a conflict condition (due to faulty devices or short circuit in the output) shall force the signal into Flashing Amber / Flashing Red.		
14	Cable less Synchronization – It shall be possible to synchronize the traffic signal controllers installed in a corridor in the following modes of operation, without physically linking them and without communication network. GPS enabled RTC shall be the reference for the cable less synchronization.		
15	Fixed Time mode with fixed offsets		
16	Vehicle Actuated mode with fixed offsets		

**D) Input and Output facilities**

#	Minimum Specifications	Bidder Compliance( Yes/No)	Product Documentation Reference
1	Lamp Switching: The controller shall have up to 64 individual output for signal lamp switching, configurable from 16 to 32 lamps. The signal lamps shall be operating on appropriate DC/AC voltage of applicable rating		
2	Detector Interface: A minimum of 16 vehicle detector inputs shall be available in the controller. All detector inputs shall be optically isolated and provided with LED indication for detection of vehicle.		
3	Communication Interface: The traffic signal controller shall support Ethernet interface to communicate with the ATCS server		

#	Minimum Specifications	Bidder Compliance( Yes/No)	Product Documentation Reference
4	Power Saving: The traffic signal controller shall have a facility to regulate the intensity of signal lamps during different ambient light conditions thereby saving energy.		
5	Real-time Clock (RTC): The GPS receiver for updating time, date and day of the week information of the traffic signal controller should be an integral part of the traffic signal controller.		
6	The traffic signal controller shall update the date, time and day of the week automatically from GPS during power ON and at scheduled intervals.		
7	Manual entry for date, time and day of week shall be provisioned for setting the traffic signal controller RTC (Real Time Clock).		
8	It shall be possible to set the RTC from the Central Server when networked		
9	Keypad (optional): The traffic signal controller shall have a custom made keypad or should have provision for plan upload and download using PC/laptop/Central Server		
10	Operator Display (optional): The traffic signal controller shall optionally have a LED backlit Liquid Crystal Display (LCD) as the operator interface.		

#### **6.1.1.2. Functional Requirement -Camera based Vehicle Detector**

The detector equipment shall be a separate logic unit, which may be integrated into the controller, or alternatively mounted in its own housing. The outputs of the detectors shall indicate the presence of vehicles and shall be used to influence the operation of the traffic signal controller and shall generate counts, demands and extensions for right-of-way. Means shall be provided so that a detector may be connected to demand and / or extend a phase movement as specified.



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#	Minimum Specifications	Bidder Compliance( Yes/No)	Product Documentation Reference
1	<b>Make</b>	<to be provided by the bidder>	
2	<b>Model</b>	<to be provided by the bidder>	
3	The MSI shall clearly specify the placement of the detector (upstream, downstream, stop-line, exit etc.) for independent straight and right turn signals.		
4	The detector shall be able to count vehicles in non-lane based mixed traffic flow conditions. The accuracy of counts shall be higher than 90% over all light and weather conditions. The MSI shall clearly specify how this is accomplished in the technical bid.		
5	The MSI shall give an estimate of the total number of vehicle presence detection zones and vehicle detectors required and the type of detection system recommended.		
6	A detector that does not change its status at least once during a stage execution shall be notified to the Central Computer (in ATCS mode) at the termination of the associated stage.		

**6.1.1.3. Functional Requirement - Countdown Timer**

Countdown Timer shall be installed at each traffic junction under ITMS & City Surveillance System.

#	Minimum Specifications	Bidder Compliance( Yes/No)	Product Documentation Reference
1	<b>Make</b>	<to be provided by the bidder>	
2	<b>Model</b>	<to be provided by the bidder>	
3	Count Down Timer shall be configured in Vehicular Mode.		
4	The Vehicular countdown timer should be dual color, <ul style="list-style-type: none"> <li>• Red for Stop or STP</li> <li>• Green color for Go</li> </ul>		

#	Minimum Specifications	Bidder Compliance( Yes/No)	Product Documentation Reference
5	There should be alternate Red and Balance phase time for STOP or STP in Flashing		
6	Alternate Green and Balance Phase Time for Go in Flashing		

#### **6.1.1.4. Functional Requirement - Communication Network**

Function of the Communication network shall be for remote monitoring of the intersection and its management. Real time data (like RTC time, stage timing, mode, events, etc.) from the traffic signal controller shall be required to be send to the DC/CCCs/ICCC. DC/ICCC running the ATCS application shall calculate and send optimum signal timings to all intersections in the corridor. The bidder shall clearly specify the bandwidth requirements and the type of network recommended for the ATCS in the technical bid.

The bidder shall specify the networking hardware requirements at the CCCs/ICCC and remote intersections for establishing the communication network.

#### **6.1.1.5. Functional Requirement -ATCS Software Application**

Objective of the ATCS would be to minimize the stops and delays in a road network to decrease the travel time with the help of state-of-the-art technology. The adaptive traffic control system shall operate in real time with the capacity to calculate the optimal cycle times, effective green time ratios, and change intervals for all system traffic signal controllers connected to it. These calculations shall be based up on assessments carried out by the ATCS application software running on a Central Computer based on the data and information gathered by vehicle detectors at strategic locations at the intersections controlled by the system.

The ATCS application software shall do the following:

#	Minimum Specifications	Bidder Compliance (Yes/No)	Product Documentation Reference
1.	<b>Make</b>	<to be provided by the bidder>	
2.	<b>Model</b>	<to be provided by the bidder>	
3.	Identify the critical junction of a corridor or a region based on maximum traffic demand and saturation.		

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#	Minimum Specifications	Bidder Compliance (Yes/No)	Product Documentation Reference
4.	The critical junction cycle time shall be used as the group cycle time i.e. cycle time common to all intersection in that corridor or region.		
5.	Stage optimization to the best level of service shall be carried out based on the traffic demand.		
6.	Cycle optimization shall be carried out by increasing or decreasing the common corridor cycle time based on the traffic demand within the constraints of Minimum and Maximum designed value of cycle time.		
7.	Offset correction shall be carried out to minimize number of stops and delays along the corridor for the priority route. Offset deviation measured using distance and speed between successive intersections shall be corrected within 5 cycles at a tolerance of +/- 5 seconds maximum.		
8.	The system shall have provision to configure priority for upstream signals as default. The ATCS software shall continuously check the traffic demand for upstream and downstream traffic and automatically assign the priority route to the higher demand direction.		
9.	Develop appropriate stage timing plans for each approach of every intersection under the ATCS, based on real time demand		
10.	Propose timing plans to every intersection under the ATCS in every Cycle		
11.	Verify the effectiveness of the proposed timing plans in every cycle		
12.	Identify Priority routes		
13.	Synchronize traffic in the Priority routes		
14.	Manage and maintain communication with traffic signal controllers under ATCS		

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#	Minimum Specifications	Bidder Compliance (Yes/No)	Product Documentation Reference
15.	Maintain database for time plan execution and system performance		
16.	Maintain error logs and system logs		
17.	Generate Reports on request		
18.	Graphically present signal plan execution and traffic flow at the intersection on desktop		
19.	Graphically present time-space diagram for selected corridors on desktop		
20.	Graphically present network status on desktop		
21.	Make available the network status and report viewing on Web		
22.	The ATCS shall generate standard and custom reports for planning and analysis		
23.	It shall be possible to interface the ATCS with a popular microscopic traffic flow simulation software for pre and post implementation analysis and study of the proposed ATCS control strategy		
24.	Shall have the ability to predict, forecast and smartly manage the traffic pattern across the signals over the next few minutes, hours or 3-5 days and just in the current real time.		
25.	Shall provide a decision support tool for assessing strategies to minimize congestion, delays and emergency response time to events via simulation and planning tools linked with real time traffic data fusion and control of traffic signaling infrastructure on ground.		
26.	Shall collect continuously information about current observed traffic conditions from a variety of data sources and of different kind (traffic states, signal states, vehicle trajectories, incidents, road works, ...)		

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#	Minimum Specifications	Bidder Compliance (Yes/No)	Product Documentation Reference
27.	Shall infer a coherent and comprehensive observed traffic state (speeds, vehicular densities, and presence of queues) on all network elements, from abovementioned observations, including vehicle trajectories, through a number of map matching, data validation, harmonization and fusion processes		
28.	Shall extend the measurements made on only a number of elements both on the rest of the unmonitored network, and over time, thus obtaining an estimation of the traffic state of the complete network and the evolution of this traffic state in the future		
29.	Shall forecast the traffic state with respect to current incidents and traffic management strategies (e.g. traffic signal control or variable message displays), improving the decision making capabilities of the operators even before problems occur		
30.	Shall calculate customizable Key Performance Indicators (KPI) to quickly assess the results		
31.	Shall provide calculated traffic flows estimation and forecast, queues and delays to Urban Control and Adaptive Signal Control Systems, allowing for proactive Traffic Management and Control		
32.	Shall generate alerts to the operator that trigger on customizable conditions in the network (starting with simple drops in flow, up to total queue lengths along emission sensitive roads surpassing a definable threshold)		
33.	Shall distribute both collected and calculated traffic information via a variety of communication protocols and channels, ensuring high interoperability degree and		

#	Minimum Specifications	Bidder Compliance (Yes/No)	Product Documentation Reference
	thus acting as a “traffic data and information hub”		
34.	Shall create a traffic data warehouse for all historic traffic information gathered from the hardware installed on the road network.		
35.	Shall operate in real time that is continuously updating the estimates on the state of the network and the travel times on the basis of data collected continuously over time.		
36.	Shall operate the traffic lights with the adaptive traffic controls, based on the current and forecasted traffic demand and the current incidents, thus optimizing the green waves continuously throughout the network		
37.	Enable a smart public transport priority respecting the delays for all road users at once with the adaptive signal controller		

#### **A) Reports**

System shall generate Corridor based and Intersection based reports. The application software shall generate the following reports, but not limited to the below. All the reports shall be possible for selected dates.

#	Minimum Specifications	Bidder Compliance (Yes/No)	Product Documentation Reference
1.	Intersection based reports		
2.	Stage Timing report – The report shall give details of time at which every stage change has taken place. The report shall show the stage sequence, stage timings and stage saturation of all stages of all cycles for a day. The saturation is defined as the ratio between the available stage timings to the actual stage timing executed by the traffic signal controller for the stage (stage preemption time).		

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#	Minimum Specifications	Bidder Compliance (Yes/No)	Product Documentation Reference
3.	Cycle Timing report – The report shall give details of time at which every cycle has taken place. The report shall show the cycle sequence and cycle timings for all the cycles in a day.		
4.	Stage switching report – The report shall give details of time at which a stage switching has taken place. The report shall show the stage sequence, stage timings and stage saturation for a day.		
5.	Cycle Time switching report – The report shall give details of time at which a cycle switching has taken place. The report shall show the cycle sequence and cycle timings for the cycle in a day.		
6.	Mode switching report – The report shall give details of the mode switching taken place on a day.		
7.	Event Report - The report shall show events generated by the controller with date and time of event.		
8.	Power on & down: The report shall show time when the master is switched on, and last working time of the master controller.		
9.	Intensity Change – The report shall show the brightness of the signal lamp is changed according to the light intensity either manually through keypad or automatically by LDR with time stamp.		
10.	Plan Change – The report shall show the time of change of plan either through keypad or remotely through a PC or Server.		
11.	RTC Failure – The report shall show the time when RTC battery level goes below the threshold value.		

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#	Minimum Specifications	Bidder Compliance (Yes/No)	Product Documentation Reference
12.	Time Update – The report shall show the time when the Master controller updated its time either manually through keypad, automatically by GPS or through remote server.		
13.	Mode Change – The report shall show the time when Master controller’s operating mode is changed either manually through keypad or a remote server. The typical modes are FIXED, FULL VA SPLIT, FULL VA CYCLE, FLASH, LAMP OFF and HURRY CALL.		
14.	Lamp Status Report – The report shall show lamp failure report with date and time of failure, color of the lamp and associated phase		
15.	Loop Failure Report – The report shall show the date and time of detector failure with detector number and associated phase.		
16.	Conflict – The report shall show the conflict between lamps (RED, AMBER, GREEN) in the same phase or conflict between lamps with other phase.		
17.	Corridor Performance Report – The report shall show the saturation of all the intersections in a corridor for every cycle executed for the corridor and the average corridor saturation for a day		
18.	Corridor Cycle Time Report – The report shall show the Corridor cycle time, Intersection cycle time, Mode of operation and degree of saturation of all the intersections in a corridor for every cycle for a day		

## **B) Graphical User Interface**

The application software shall have the following Graphical User Interface (GUI) for user friendliness.



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#	Minimum Specifications	Bidder Compliance (Yes/No)	Product Documentation Reference
1.	User login – Operator authentication shall be verified at this screen with login name and password		
2.	Network Status Display – This online display shall indicate with appropriate color coding on site map whether an intersection under the ATCS is online or off. On double clicking the intersection a link shall be activated for the traffic flow display for the intersection.		
3.	Traffic Flow Display – This online display shall indicate the current traffic flow with animated arrows, mode of operation, stage number being executed and elapsed stage time.		
4.	Saturation Snapshot – This display shall show the current saturation levels of all intersections in a corridor.		
5.	Reports Printing / Viewing – This link shall allow selection, viewing and printing of different reports available under ATCS		
6.	Time-Space Diagram – The time-space diagram shall display the current stages being executed at every intersection in a corridor with immediate previous history.		
7.	Junctions shall be plotted proportional to their distance on Y-axis and time elapsed for the stage in seconds on X-axis.		
8.	Junction names shall be identified with each plot.		
9.	Facility shall be available to plot the time-space diagram from history.		
10.	Currently running stage and completed stages shall be identified with different colors.		
11.	Stages identified for synchronization shall be shown in a different color.		

#	Minimum Specifications	Bidder Compliance (Yes/No)	Product Documentation Reference
12.	Speed lines shall be plotted for stages identified for synchronization to the nearest intersection in both directions.		
13.	It should be possible to freeze and resume online plotting of Time-Space diagram.		
14.	The system shall have other graphical interfaces for configuring the ATCS, as appropriate.		

### **6.1.2. Technical Specifications - Adaptive Traffic Control System (ATCS)**

#### **6.1.2.1. Adaptive Traffic Control- Traffic Sensor**

Appropriate camera based traffic sensors may be chosen to provide the operational levels and accuracy as required for successful function of the ATCS system as per the SLAs defined.

#### **6.1.2.2. Adaptive Traffic Control- Traffic Controller**

Appropriate controller technology may be chosen to provide the operational levels and accuracy as required for successful function of the ATCS system as per the SLAs defined. The proposed traffic controller shall be disabled friendly and shall also provide audio tones output.

#### **6.1.2.3. Adaptive Traffic Control- Traffic Light Aspects**

S. No.	Minimum Specifications	Bidder Compliance(Yes/No)	Product Documentation Reference
1.	<b>Make</b>	<to be provided by the bidder>	
2.	<b>Model</b>	<to be provided by the bidder>	
3.	<b>Key Features:</b>		
a.	Shall have less power consumption for all colors, preferably maximum power should not exceed 8 watts for each color		
b.	Shall preferably have temperature compensated power supplies for longer LED life		

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S. No.	Minimum Specifications	Bidder Compliance(Yes/No)	Product Documentation Reference
c.	Shall have uniform appearance light diffusing		
d.	Should be Intertek/ETL/EN compliant		
e.	All units operate at voltage of - 12 / 24 volts DC		
f.	LED shall be single source narrow beam type with clear lens & Luminance uniformity		
g.	Pedestrian traffic lights should be provided with clearly audible signals for the benefit of pedestrians with visual impairments		
h.	Phantom Class 5 or equivalent. IP Rating: IP65		
<b>4.</b>	<b>LED aspects:</b>		
a.	Red, Amber, Green-Full (300 mm diameter) : Hi Flux		
b.	Green-arrow (300 mm diameter): Hi flux		
c.	Animated Pedestrian-Red and Green Animated countdown (300 mm) Hi Brite with diffusions		
<b>5.</b>	<b>LED Retrofit Specifications:</b>		
a.	Power supply shall be preferably 230 Vac +/- 10% and frequency 50+/-5Hz		
b.	Standards: EN 12368 compliant		
c.	Convex Tinted Lens shall be provided		
d.	Fuse and Transients shall be provided		
e.	Operating Temperature Range: As per Allahabad weather conditions Turn Off/Turn On Time: 75 milli seconds max		
f.	Total Harmonic Distortion: <20%		
g.	Electromagnetic interference: Should meet FCC Title 47,Subpart B, Section 15 Regulation or equivalent EN/IRC standard		
h.	Blowing Rain/Dust Spec: MIL 810F or Equivalent EN/IRC standard complaint		
i.	Minimum Luminous Intensity (measured at intensity point)(cd):		

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S. No.	Minimum Specifications	Bidder Compliance(Yes/No)	Product Documentation Reference
	Red 400 Amber 400 Green 400		
j.	Dominant Wavelength (nm): Red 630 Amber 590 Green 490		
k.	Lamp conflict compatibility system: Compatible with lamp failure and conflict detection		

**6.1.2.4. Countdown Timer**

#	Parameters	Minimum Specifications	Bidder Compliance (Yes/No)	Product Documentation Reference
1.	<b>Make</b>	<to be provided by the bidder>		
2.	<b>Model</b>	<to be provided by the bidder>		
3.	<b>CPU</b>	Micro Controller based or better		
4.	<b>Mechanical Specifications</b>			
A	Structural Material	Polycarbonate strengthened against UV rays		
B	Body Color	Light Grey/Black		
5.	<b>Display Specification</b>			
A	Lamp Diameter	Minimum 300mm		
B	Digit Height	Minimum 150 -165mm		
C	Display Type	Dual Colored (Red & Green)		
D	No. of Digit	Minimum 3		
6.	<b>LED Specifications</b>			
A	LED Diameter	Minimum 5mm LED		
B	Viewing Angle	Minimum 30°		

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#	Parameters	Minimum Specifications	Bidder Compliance (Yes/No)	Product Documentation Reference
C	LED Wave Length	Preferably 630-640nm (Red), 505nm - 520nm (Blue-Green)		
D	LED Dice Material	AlInGap (Red), InGaN (Blue-Green)		
<b>7.</b>	<b>Technical Features</b>			
A	Power Consumption	Preferably 20 - 30 Watt Per Lamp		
B	Input Power	Preferably 85-260V AC, 50Hz		
C	Operating Temperature	As per Allahabad weather conditions		
D	Humidity	As per Allahabad weather conditions		
E	Water & Dust Ingress	IP 65		
F	Standard	EN12966 Compliant		

**6.1.2.5. Cables for Traffic Signals**

Sr. No	Parameters	Minimum Specifications	Bidder Compliance (Yes/No)	Product Documentation Reference
1.	<b>Make</b>	<to be provided by the bidder>		
2.	<b>Model</b>	<to be provided by the bidder>		
3.	No's of core	As per design requirements		
4.	Materials	As per design requirements		
5.	Certification	ISI Marked		
6.	Standards	Indian Electricity Act and Rules		

<b>Sr. No</b>	<b>Parameters</b>	<b>Minimum Specifications</b>	<b>Bidder Compliance (Yes/No)</b>	<b>Product Documentation Reference</b>
A.	IS:1554	PVC insulated electric cables (heavy duty)		

## **6.2. Surveillance System**

The functional requirements and technical specifications provided in the below sections and at other sections in this RFP are indicative and carry guiding rule. The MSI is free to offer products and solutions which meet requirements of the RFP focusing on the outcome, future scalability, security, reliability and adherence to specified SLA under this RFP, in line with applicable standards & best practices adopted in the industry. The MSI is encouraged to design an Optimized solution which is technically superior, innovative, proven, better in terms of functionality and is cost effective. Any specified parameters mentioned in the scope/technical requirement in the RFP may be considered if it is required for meeting current & future requirements during the contract period. The MSI is fully responsible for the specified outcome to be achieved.

### **6.2.1. Functional Requirement – Surveillance System**

Functional Requirement of the overall Surveillance System can be categorized into following components:

1. Information to be Captured by Edge Devices
2. Information to be analysed at CCCs/ICCC
3. Role Based Access to the Entire System
4. Storage / Recording Requirements
5. Other General Requirements

#### **6.2.1.1. Information to be captured by Edge Devices**

Surveillance Cameras being one of the core sub modules of ICCC project, it is important that their selection and placement is carefully done to ensure the full coverage of the traffic junction along with all associated junction arms, accuracy of the information captured on the field and they are rugged, durable & compact. These cameras need to work on 24 X 7 basis and transmit quality video feeds to the CCCs & ICCC and would capture the video feeds at 25 FPS for 15 days storage during duration of Kumbh Mela 2019. Post Kumbh Mela, the camera will be reconfigured at 15 FPS for 30 days storage post Kumbh Mela 2019. However, Allahabad Police may take the regular review of the requirements for video resolution, FPS and may change these numbers to suit certain specific requirements (for example, there could be a situation when certain cameras are required to be viewed at higher FPS for specific period. It is estimated that not more than 5% of the cameras would be required to be viewed at higher FPS at a given point of time).

#### **6.2.1.2. Information to be analyzed at CCCs/ICCC**

The proposed Video Management System should provide a complete end-to-end solution for security surveillance application. The control center shall allow an operator to view live / recorded video from any surveillance camera on the IP network. The combination of control center and the IP network would create a virtual matrix, which would allow switching of video streams around the system.

It has been envisaged that all surveillance cameras would not be simultaneously viewed at Integrated Command & Control Center. The viewing shall vary from time to time which shall help to manage traffic at the junctions and coordinate with the field police officers.

#### **6.2.1.3. Role-Based Access to the Entire System**

Various users should have access to the system using single sign on and should be role based. Different roles which could be defined (to be finalized at the stage of implementation) could be Administrator, Supervisor, Officer, Operator, etc. Apart from role based access, the system should also be able to define access based on location. Other minimum features required in the role based authentication systems are as follows:

- a. The management module should be able to capture basic details (including mobile number & email id) of the Police Personnel & other personnel requiring Viewing / Administration rights to the system. There should be interface to change these details, after proper authentication.
- b. Rights to different modules / sub-modules / functionalities should be role based and proper log report should be maintained by the system for such access.
- c. The system should be with login name & password enabled to ensure that only the concerned personnel are able to login into the system
- d. There should be provision to specify hierarchy of operators / officers for control of the cameras from various locations.
- e. The number of users shall increase as per phase wise implementation. MSI is expected to estimate and provision the same based on the phase wise requirements.
- f. Windows Active Directory/LDAP or any such system can be used to design role based access.

#### **6.2.1.4. Storage/Recording Requirements**

It is proposed that the storage solution shall be modular enough to ensure compliance to the changes in storage / recording policy, to be evolved upon initial deployment of the system. The following storage requirements shall be fulfilled by the MSI as scope for the project:

- a. The Data Center (DC) shall be co-located at Integrated Command & Control Center (ICCC)
- b. The storage estimation shall be done basis of following requirements:

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S. No	System	Number of Days for recording	Primary Storage Requirement	Secondary Storage Requirement
1	<b>Surveillance System</b>	30 days	7	23 Days and 90 days for Flagged data (critical incidents) for 10% of total number of cameras
2	<b>ANPR, RLVD</b>	90 Days	7	83 Days
3	<b>ATCS</b>	5 Years	365 Days	4 Years

- c. Data on storage would be over-written automatically by newer data after the stipulated time period. If some data is flagged by police personnel (or by designated personnel) as important data / evidence data due to some reporting of crime or accident in the area or due to court order or due to suspicious activity, it would need to be stored for longer duration, as per requirements. Allahabad Police would analyse such flagged data every 3months to take such decisions for preservation of the flagged data beyond 90 days.
- d. Full audit trail of reports to be maintained for 90 days.
- e. Archival/Backup to be done on NAS / Scale-out NAS / SAN / Unified or equivalent storage solution
- f. Retrieval time for any data stored on secondary storage should be max. 4 hours for critical data & 8 hours for other data.
- g. The recording servers / system, once configured, shall run independently of the Video Management system and continue to operate in the event that the Management system is off-line.
- h. The system shall support the use of separate networks, VLANs or switches for connecting the cameras to the recording servers to provide physical network separation from the clients and facilitate the use of static IP addresses for the devices.
- i. The system shall support H.264 or better, MPEG-4 and MJPEG compression formats for all analog cameras connected to encoders and all IP cameras connected to the system.
- j. The system shall record the native frame rate and resolution supplied by the camera or as configured by the operator from the system administration server.



- k. The system should not limit amount of storage to be allocated for each connected device.
- l. The on-line archiving capability shall be transparent and allow Allahabad Police to browse and archive recordings without the need to restore the archive video to a local hard drive for access.
- m. The system shall allow for the frame rate, bit rate and resolution of each camera to be configured independently for recording. The system shall allow the user to configure groups of cameras with the same frame rate, bit rate and resolution for efficient set-up of multiple cameras simultaneously.
- n. The system shall support archiving or the automatic transfer of recordings from a camera's default database to another location on a time-programmable basis without the need for user action or initiation of the archiving process. Archiving shall allow the duration of the camera's recordings to exceed the camera's default database capacity. Archives shall be located on either the recording server or on a connected network drive. If the storage area on a network drive becomes unavailable for recording the system should have the ability to trigger actions such as the automatic sending of email alerts and sound alerts to necessary personnel.
- o. Bandwidth optimisation
  - The Recording Server / System shall offer different codec (H.264, MJPEG, MPEG-4, etc.) and frame rate (CIF, 4CIF, QCIF or higher) options for managing the bandwidth utilization for live viewing on the Client systems. (through use of multiple systems such as transcoding server)
  - From the Allahabad Police, the user shall have the option of having video images continually streamed or only updated on motion to conserve bandwidth between the Client systems and the Recording Server.
- p. The Recording Server / System shall support camera (analogue and IP cameras) devices from various manufacturers.
- q. The Recording Server / System shall support the PTZ protocols of the supported devices listed by the camera OEMs.
- r. The system shall support full two-way audio between Client systems and remote devices. (Audio from certain set of cameras can be recorded in future).
- s. Failover Support
  - The system shall support automatic failover for recording servers. This functionality shall be accomplished by failover server as a standby unit that shall take over in the event that one of a group of designated recording servers fails. Recordings shall be synchronized back to the original recording server once it is back online.
  - The system shall support multiple failover servers for a group of recording servers.
- t. SNMP Support

- The system shall support Simple Network Management Protocol (SNMP) in order for third-party software systems to monitor and configure the system.
- The system shall act as an SNMP agent which can generate an SNMP trap as a result of rule activation in addition to other existing rule actions.

#### **6.2.1.5. Other General Requirements**

##### **1. Management/Integration functionality**

- a. The Surveillance System shall offer centralised management of all devices, servers and users.
- b. The Surveillance System should not have any limit on the number of cameras to be connected for Surveillance, Monitoring and recording. Any increase in the no. of cameras should be possible by augmentation of Hardware components.
- c. The Surveillance System should have ability to knit the video streams from multiple cameras, based on the date/time stamp. Every video stream shall have date, time, source camera location, FPS etc. water-marked. These attributes shall be finalised at the System Design time. There shall be a centralised NTP server, from which all devices shall synchronise the date and time.
- d. The Surveillance System shall support distributed viewing of any camera in the system using Video walls or big screen displays.
- e. The Surveillance System shall support alarm management. The alarm management shall allow for the continuous monitoring of the operational status and event-triggered alarms from system servers, cameras and other external devices.
- f. It should be possible to integrate the Surveillance System with 3rd-party software, to enable the users to develop customized applications for enhancing the use of video surveillance solution. For e.g., integrating alarm management to initiate SMS, E-Mail, VoIP call etc.
- g. It should be possible to integrate social media platforms to Surveillance System to enable Allahabad Police to track and monitor certain trending incident or crime.
- h. The Management system shall store the overall network elements configuration in central database, either on the management server computer or on a separate DB Server on the network.
- i. System should be able to be integrated with Event Management / Incident Management System, if implemented by Allahabad Police in future.

##### **2. System Administration functionality**

- a. The System Administration Server shall provide a feature-rich administration client for system configuration and day-to-day administration of the system
- b. The System Administration Server shall support different logs related to the Management Server

- The System Log
- The Audit Log
- The Alert Log
- The Event Log

### **3. Rules**

The system shall support the use of rules to determine when specific actions occur. Rules shall define what actions shall be carried out under specific conditions. The system shall support rule initiated actions such as:

- Start and stop recording
- Set non-default live frame rate
- Set non-default recording rate
- Start and stop PTZ patrolling
- Send notifications via email
- Pop-up video on designated Client Monitor recipients

### **4. Client System**

- a. The Client system shall provide remote users with rich functionality and features as described below.
  - Viewing live video from cameras on the surveillance system
  - Browsing recordings from storage systems
  - Creating and switching between multiple of views.
  - Viewing video from selected cameras in greater magnification and/or higher quality in a designated hotspot.
  - Controlling PTZ cameras.
  - Using digital zoom on live as well as recorded video.
  - Using sound notifications for attracting attention to detected motion or events.
  - Getting quick overview of sequences with detected motion.
  - Getting quick overviews of detected alerts or events.
  - Quickly searching selected areas of video recording for motion (also known as Smart Search).

### **5. Remote Web Client**

The web-based remote client shall offer live view of up to 16 cameras, including PTZ control and event / output activation. The Playback function shall give the user concurrent playback of multiple recorded videos with date, alert sequence or time searching.

- a. User Authentication – The Remote Client shall support login using the user name and password credentials

### **6. Matrix Monitor**

- a. Matrix Monitor – The Matrix Monitor feature shall allow distributed viewing of multiple camera on the system on any monitor
- b. The Matrix Monitor feature shall access the H.264/MJPEG/MPEG4 stream from the connected camera directly and not sourced through the recording server

### **7. Alarm Management Module**

- a. The alarm management module shall allow for continuous monitoring of the operational status and event-triggered alarms from various system servers, cameras and other devices. The alarm management module shall provide a real-time overview of alarm status or technical problems while allowing for immediate visual verification and troubleshooting.
- b. The alarm management module shall provide interface and navigational tools through the client including;
  - o Graphical overview of the operational status and alarms from servers, network cameras and external devices including motion detectors and access control systems.
  - o Intuitive navigation using a map-based, hierarchical structure with hyperlinks to other maps, servers and devices or through a tree-view format.
- c. The module shall include flexible access rights and allow each user to be assigned several roles where each shall define access rights to cameras.
- d. VMS should be capable to accept third party generated events / triggers
- e. Based on alarms/alerts, customised/standard alert messages should be published on VMD/PA, after authorisation by a supervisor/operator.

#### **8. Other Miscellaneous Requirements**

- a. System should have a facility to create CDs or other storage media for submission to Judiciary, which can be treated evidence for legal matters. Such storage media creation should be tamper proof and MSI to provide appropriate technology so that integrity and quality of evidence is maintained as per requirements of the judiciary. Bidder is required to specify any additional hardware / software required for this purpose & the same can be listed in miscellaneous section of the commercial bid. MSI shall also prepare the guideline document to be followed by the Police Personnel for the retrieval of Video / images from the CCTV System so as to maintain integrity of the evidence. Such a guideline document should include methods of retrieval of data, check-list to be followed and flowchart of the entire process to be followed.
- b. All the systems proposed and operationalisation of Video Management System should comply with requirements of IT Acts.
- c. Any hardware or software required to achieve the functional requirement and technical solution of the overall Project (may not be not specified in the schedule) is to be proposed in the Bid and the applicable cost shall be borne by the MSI.
- d. Bidder shall be required to provide a standardized Mobile Application to integrate smart phones and tablets for 2-way communication with the Surveillance System in a secure manner. Allahabad Police may provide such tablets / smart phones to the designated Police Personnel. It shall be responsibility of MSI to configure such tablets / Smartphone, for the Surveillance System being implemented a part of this project, and ensure that all the necessary access is given to these mobile users. Functionalities to be provided through mobile application: Viewing of any video stream from Central VMS, uploading of video / pictures central VMS, Location based GIS Map access, tagging of mobile device/location information for all relevant functionalities.

- e. There would be the provision for Third party audit periodically, paid by ASCL separately. ASCL reserves the right to appoint any Independent Evaluation Agency at any time during the phases of the project.

## **6.2.2. Technical Specifications – Surveillance System**

### **6.2.2.1. PTZ Cameras**

#	Parameters	Minimum Specifications	Bidder Compliance (Yes/No)	Product Documentation Reference
1.	<b>Make</b>	<to be provided by the bidder>		
2.	<b>Model</b>	<to be provided by the bidder>		
3.	Video Compression	H.264		
4.	Video Resolution	1920 X 1080		
5.	Frame rate	Min. 25 fps		
6.	Image Sensor	1/3" OR 1/4" Progressive Scan CCD / CMOS		
7.	Lens	Auto-focus, 4.3 - 129 mm (corresponding to 30x)		
8.	Minimum Illumination	Colour: 0.5 lux, B/W: 0.1 lux (at 30 IRE)		
9.	Day/Night Mode	Colour, Mono, Auto		
10.	S/N Ratio	≥ 50Db		
11.	PTZ	Pan: 360° endless/continuous, 0.2 to 300°/s (auto), 0.2 to 100°/s (Manual) Tilt: 90°, 0.2 to 100°/s (Auto), 0.2 to 40°/s (Manual) 30x optical zoom and 10x digital zoom 64 preset positions Auto-Tracking Pre-set tour		
12.	Auto adjustment + Remote	Colour, brightness, sharpness, contrast,		

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#	Parameters	Minimum Specifications	Bidder Compliance (Yes/No)	Product Documentation Reference
	Control of Image settings	white balance, exposure control, backlight compensation, Gain Control, Wide Dynamic Range		
13.	Protocol	HTTP, HTTPS, FTP, RTSP, RTP, TCP, UDP, RTCP, DHCP, UPnP, QoS, IPV4, IPV6, ONVIF Profile S		
14.	Security	Password Protection, IP Address filtering, User Access Log, HTTPS encryption		
15.	Operating conditions	As per City weather conditions		
16.	Casing	NEMA 4X / IP-66 rated, Built in Heater and Blower		
17.	Certification	UL/EN,CE,FCC		
18.	Local storage	Minimum 64 GB Memory card in a Memory card slot. In the event of failure of connectivity to the central server the camera shall record video locally on the SD card automatically. After the connectivity is restored these recordings shall be automatically merged with the server recording such that no manual intervention is required to transfer the SD card based recordings to server.		
19.	IR	Internal/External. IR range should be 100 mtr or better		

**6.2.2.2. Fixed Box Cameras**

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#	Parameters	Minimum Specifications	Bidder Compliance (Yes/No)	Product Documentation Reference
1.	<b>Make</b>	<to be provided by the bidder>		
2.	<b>Model</b>	<to be provided by the bidder>		
3.	Video Compression	H.264		
4.	Video Resolution	1920 X 1080		
5.	Frame rate	Min. 30 fps		
6.	Image Sensor	1/3" Progressive Scan CCD / CMOS		
7.	Lens Type	Varifocal, C/CS Mount, IR Corrected Full HD		
8.	Lens#	Auto IRIS 5~50mm/ 8 – 40 mm, F1.4		
9.	Minimum Illumination	Colour: 0.5 lux, B/W: 0.1 lux (at 30 IRE)		
10.	IR Cut Filter	Automatically Removable IR-cut filter		
11.	Day/Night Mode	Colour, Mono, Auto		
12.	S/N Ratio	≥ 50 Db		
13.	Auto adjustment + Remote Control of Image settings	Colour, brightness, sharpness, contrast, white balance, exposure control, backlight compensation, Gain Control, Wide Dynamic Range		
14.	Local storage	Minimum 64 GB Memory card in a Memory card slot. In the event of failure of connectivity to the central server the camera shall record video locally on the SD card automatically. After the connectivity is restored these recordings shall be automatically merged with the server recording such that no manual intervention is required to transfer the SD card based recordings to server.		
15.	Protocol	IPV4, IPV6, HTTP, HTTPS, FTP/SMTP, NTP, RTSP, RTP, TCP, UDP, RTCP, DHCP, UPnP, QoS, ONVIF Profile S		

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#	Parameters	Minimum Specifications	Bidder Compliance (Yes/No)	Product Documentation Reference
16.	Security	Password Protection, IP Address filtering, User Access Log, HTTPS encryption		
17.	Operating conditions	As per City weather conditions		
18.	Intelligent Video	Motion Detection & Tampering alert		
19.	Alarm I/O	Minimum 1 Input & 1 Output contact for 3rd part interface		
20.	Casing	NEMA 4X / IP-66 rated, IK10, Built in Heater and Blower		
21.	Certification	UL/EN, CE,FCC		

About 56 would be used for ANPR (Automatic Number Plate Recognition). Please note that the exact numbers may change depending upon the survey carried out by the successful bidder along with Police Dept. Bidders are required to provide necessary provisions in these cameras to support Analytics.

#### **6.2.2.3. IR Illuminators**

The infrared illuminators are to be used in conjunction with the Fix Box / PTZ cameras specified above to enhance the night vision.

#	Parameters	Minimum Specifications	Bidder Compliance (Yes/No)	Product Documentation Reference
1.	<b>Make</b>	<to be provided by the bidder>		
2.	<b>Model</b>	<to be provided by the bidder>		
3.	Range	Min. 100 meters, with adjustable angle to cover the complete field of view at specified locations		
4.	Minimum Illumination	High sensitivity at Zero Lux		
5.	Power	Automatic on/off operation		
6.	Casing	NEMA 4X / IP-66 rated		
7.	Operating conditions	As per City weather conditions		



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#	Parameters	Minimum Specifications	Bidder Compliance (Yes/No)	Product Documentation Reference
8.	Certification	UL/EN/CE/FCC		

**6.2.2.4. Field Junction Box**

#	Parameters	Minimum Specifications	Bidder Compliance (Yes/No)	Product Documentation Reference
1.	<b>Make</b>	<to be provided by the bidder>		
2.	<b>Model</b>	<to be provided by the bidder>		
3.	Size	Suitable size as per site requirements to house the field equipment		
4.	Cabinet Material	GI with powder coated		
5.	Material Thickness	Min 1.2mm		
6.	Number of Locks	Minimum Two		
7.	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		
8.	Mounting	On Camera Pole / Ground mounted on concrete base		
9.	Form Factor	Rack Mount/DIN Rail		
10.	Other Features	Rain Canopy, Cable entry with glands, proper earthing and Fans/any other accessories as required for operation of equipment's within junction box.		

#### **6.2.2.5. Poles for Camera**

#	Parameters	Minimum Specifications	Bidder Compliance (Yes/No)	Product Documentation Reference
1.	<b>Make</b>	<to be provided by the bidder>		
2.	<b>Model</b>	<to be provided by the bidder>		
3.	Pole type	Hot Dip Galvanized after Fabrication with Silver coating of 86 micron as per IS:2629; Fabrication in accordance with IS-2713 (1980)		
4.	Height	5-10 Meters (or higher), as-per-requirements for different types of cameras & Site conditions		
5.	Pole Diameter	Min. 10 cm diameter pole (bidder to choose larger diameter for higher height)		
6.	Cantilevers	Based on the location requirement suitable size cantilevers to be considered with the pole		
7.	Bottom base plate	Minimum base plate of size 30x30x1.5 cm		
8.	Mounting facilities	To mount RLVD Cameras, ANPR, CCTV cameras, Traffic Signals, Pedestrian Signals, Switch, etc.		
9.	Pipes, Tubes	All wiring must be hidden, through tubes/pipes. No wires shall be visible from outside.		
10.	Foundation	Casting of Civil Foundation with foundation bolts, to ensure vibration free		

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#	Parameters	Minimum Specifications	Bidder Compliance (Yes/No)	Product Documentation Reference
		erection (basic aim is to ensure that video feed quality is not impacted due to winds in different climatic conditions). Expected foundation depth of min. 100cms.  Please refer to earthing standards mentioned elsewhere in the document.		
11.	Protection	Lightning arrester shall be provided, to protect all field equipment mounted on pole.		

**6.2.2.6. Edge Level Switch at Field Locations**

#	Parameters	Minimum Specifications	Bidder Compliance (Yes/No)	Product Documentation Reference
1.	Port Density & Redundancy	The switch should be rugged outdoor DIN rail mountable 8 ports 10/100/1000TX PoE+( min. 4 Port IEEE802.3at Or 8 Port 802.3af) and with 2 100/1000x SFP ports  May require higher port density at some locations, depending upon site conditions		
2.	PoE Standard	IEEE 802.3af/ IEEE 802.3at or better on all ports simultaneously		
3.	Quality of Service	Support for Egress rate limiting, Eight egress queues per port, Voice VLAN, DSCP for IP-based QoS, Differentiated services architecture, IEEE 802.1p Class of Service with strict and weighted round Robin scheduling.		
4.	Multicast support	IGMP Snooping V1, V2, V3		

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#	Parameters	Minimum Specifications	Bidder Compliance (Yes/No)	Product Documentation Reference
5.	Management	SNMP V1,V2,V3, Web GUI, CLI, USB or equivalent memory card, IP v6 management feature on open standards, IEEE802.1ag, TDM or equivalent standards		
6.	Security	Should support Access Control Lists (ACLs), DHCP snooping, IEEE802.1x based port authentication, RADIUS, TACACS, SSL, SSH, port mirroring, NTP		
7.	Resiliency	IEEE802.1q, IEEE802.1d, IEEE802.1s, IEEE802.1w, ring resilience/ring protection		
8.	PoE Power per port	Sufficient to operate the CCTV cameras/edge devices connected		
9.	Enclosure Rating	IP 30 or equivalent Industrial Grade Rating (to be housed in Junction box)		
10.	Operating Temperature	As per Allahabad weather conditions		
11.	Safety Certifications	UL/EN/IEC or equivalent, RoHS standards, NEMA –TS2		

**6.2.2.7. Online UPS for field locations**

Sr No	Parameters	Minimum Specifications	Bidder Compliance (Yes/No)	Product Documentation Reference
1.	<b>Make</b>	<to be provided by the bidder>		
2.	<b>Model</b>	<to be provided by the bidder>		
3.	Capacity	Adequate capacity to cover all above IT Components at respective field locations		
4.	Technology	IGBT based PWM Technology, True Online UPS or better		
5.	Input Frequency Range	45 to 55 Hz		
6.	Output Frequency Range	45 to 55 Hz		
7.	Output Voltage	220VAC - 230VAC		

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Sr No	Parameters	Minimum Specifications	Bidder Compliance (Yes/No)	Product Documentation Reference
8.	Voltage Regulation	+/-2% (or better) and with built-in Over Voltage Cut off facility in the Device		
9.	Frequency	50 Hz +/- 0.1% (free Run Mode)		
10.	Harmonic Distortion (THD)	< 3% (linear load)		
11.	Output Waveform	Pure Sine wave		
12.	Output Power Factor	0.8 or more		
13.	Battery Backup	Adequate and required battery backup to achieve required uptime of field device as well as SLA of the overall solution.		
14.	Battery Type	Preferably Lead acid, Sealed Maintenance Free (SMF)		
15.	General Operating Temperature	As per Allahabad weather conditions		
16.	Alarms & Indications	All necessary alarms & indications essential for performance monitoring of UPS like mains fail, low battery & fault detection		
17.	Bypass	Automatic, Manual Bypass Switch		
18.	Certifications	For Safety & EMC as per international standard		
19.	Overall Protection	IP 55, Junction Box design should ensure to keep the temperature within		

Sr No	Parameters	Minimum Specifications	Bidder Compliance (Yes/No)	Product Documentation Reference
		suitable operating range for equipment's and should also avoid intentional water splash and dust intake		

#### **6.2.2.8. ANPR System**

The ANPR System shall enable monitoring of vehicle flow at strategic locations. The system shall support real-time detection of vehicles at the deployed locations, recording each vehicle, reading its number plate, database lookup from central server and triggering of alarms/alerts based on the vehicle status and category as specified by the database. The system usage shall be privilege driven using password authentication.

#	Minimum Specifications	Bidder Compliance (Yes/No)	Product Documentation Reference
1.	<b>Make</b>	<to be provided by the bidder>	
2.	<b>Model</b>	<to be provided by the bidder>	
3.	<b>Vehicle Detection by Color</b> <ul style="list-style-type: none"> <li>The system shall detect the color of all vehicles in the camera view during daytime and label them as per the predefined list of configured system colors. The system shall store the color information of each vehicle along with the license plate information for each transaction in the database.</li> <li>The system shall have options to search historical records for post event analysis by the vehicle color or the vehicle color with license plate and date time combinations</li> </ul>		
4.	<b>Alert Generation</b> <ul style="list-style-type: none"> <li>The system should have option to input certain license plates according to the hot listed categories like "Wanted", "Suspicious", "Stolen", etc. by authorized personnel.</li> </ul>		

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#	Minimum Specifications	Bidder Compliance (Yes/No)	Product Documentation Reference
	<ul style="list-style-type: none"> <li>The system should be able to generate automatic alarms to alert the control room personnel for further action, in the event of detection of any vehicle falling in the hot listed categories.</li> </ul>		
5.	<b>Vehicle Status Alarm Module</b> <ul style="list-style-type: none"> <li>On successful recognition of the number plate, system should be able generate automatic alarm to alert the control room for vehicles which have been marked as "Wanted", "Suspicious", "Stolen", "Expired". (System should have provision/expansion option to add more categories for future need).</li> <li>The Instantaneous and automatic generation of alarms. In case of identity of vehicle in any category which is define by user.</li> </ul>		
6.	<b>Vehicle Log Module</b> <ul style="list-style-type: none"> <li>The system shall enable easy and quick retrieval of snapshots, video and other data for post incident analysis and investigations.</li> <li>The system should be able to generate suitable MIS reports that shall provide meaningful data to concerned authorities and facilitate optimum utilization of resources. These reports shall include. <ul style="list-style-type: none"> <li>Report of vehicle flow at each of the installed locations for Last Day, Last Week and Last Month.</li> <li>Report of vehicles in the detected categories at each of the installed locations for Last Day, Last Week and Last Month.</li> </ul> </li> </ul>		

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#	Minimum Specifications	Bidder Compliance (Yes/No)	Product Documentation Reference
	<ul style="list-style-type: none"> <li>○ Report of Vehicle Status change in different Vehicle Categories.</li> <li>• The system shall have Search option to tune the reports based on license plate number, date and time, site location as per the need of the authorities.</li> <li>• The system shall have option to save custom reports for subsequent use. The system shall have option to export report being viewed to common format for use outside of the ANPRS or exporting into other systems.</li> <li>• The system should provide advanced and smart searching facility of License plates from the database. There should be an option of searching number plates almost matching with the specific number entered (up to 1 and 2 character distance)</li> </ul>		
7.	<p><b>Vehicle Category Editor</b></p> <ul style="list-style-type: none"> <li>• The system should have option to input certain license plates according to category like "Wanted", "Suspicious", and "Stolen", "Expired" etc. by Authorized personnel.</li> <li>• The system should have an option to add new category by authorized personnel.</li> <li>• The system should have option to update vehicle status in specific category by authorized personnel. E.g. on retrieval of stolen vehicle, system entry should be changed from "Stolen" to "Retrieved".</li> </ul>		



#	Minimum Specifications	Bidder Compliance (Yes/No)	Product Documentation Reference
	<ul style="list-style-type: none"> <li>System should have option to specify maximum time to retain vehicle records in specific categories.</li> </ul>		
8.	<p><b>Central Management Module</b></p> <ul style="list-style-type: none"> <li>The Central Management Module shall run on the ANPR Central Server in control booth. It should be possible to view records and edit hotlists from the Central Server.</li> </ul> <p><b>ANPR Specification</b></p> <ul style="list-style-type: none"> <li>Base Specification of Fixed Box Cameras (Section 6.2.2.2 of Annexure I) must be part of the ANPR specifications.</li> </ul> <p><b>Camera Housing</b></p> <ul style="list-style-type: none"> <li>IP66 standard with sunshield vandal proof Housing</li> </ul>		
9.	<p><b>Systems requirement</b></p> <ul style="list-style-type: none"> <li><b>Local Server at Intersection:</b> The system shall run on a Commercial Off the Shelf Server (COTS). Outdoor IP 66 Quad core processor based server should be able to cover at least 8 lanes. Temperature rating of the server should be as per Allahabad weather conditions.</li> <li><b>Operating system:</b> The system shall be based on open platform and should run on Linux or windows Operating system.</li> <li><b>Workstation:</b> Workstation shall run on latest available OS.</li> </ul>		

#### **6.2.2.9. Video Management System**

Video management system shall constitute of a platform which shall be designed for viewing, recording and replaying acquired video as part of overall project solution. This platform shall

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be based on the Internet Protocol (IP) open platform concept. Major functionalities are described here:

**VMS Overview**

#	Minimum Specifications	Bidder Compliance (Yes/No)	Product Documentation Reference
1.	<b>Make</b>	<to be provided by the bidder>	
2.	<b>Model</b>	<to be provided by the bidder>	
3.	VMS shall be used for centralized management of all field camera devices, video servers and client users.		
4.	VMS server shall be deployed in a clustered server environment or support inbuilt mechanism for high availability and failover.		
5.	VMS shall support a flexible rule-based system driven by schedules and events.		
6.	VMS shall be supported for fully distributed solution for monitoring and control function, designed for limitless multi-site and multiple server installations requiring 24/7 surveillance with support for devices from different vendors.		
7.	VMS shall support ONVIF compliant internet protocol (IP) cameras.		
8.	The bidder shall clearly list in their proposal the make and models that can be integrated with the VMS, additionally all the offered VMS and cameras must have Open Network Video Interface Forum (ONVIF) compliance.		

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#	Minimum Specifications	Bidder Compliance (Yes/No)	Product Documentation Reference
	VMS shall be enabled for any standard storage technologies and video wall system integration.		
9.	VMS shall be enabled for integration with any external Video Analytics Systems both server & edge based.		
10.	VMS shall be capable of being deployed in a virtualized server environment without loss of any functionality.		
11.	All CCTV cameras locations shall be overlaid in graphical map in the VMS Graphical User Interface (GUI). The cameras selection for viewing shall be possible via clicking on the camera location on the graphical map. The graphical map shall be of high resolution enabling operator to zoom-in for specific location while selecting a camera for viewing.		
12.	VMS shall have an administrator interface to set system parameters, manage codecs, manage permissions and manage storage.		
13.	VMS day-to-day control of cameras and monitoring on client workstations shall be controlled through the administrator interface.		
14.	Whilst live control and monitoring is the primary activity of the monitoring workstations, video replay shall also be accommodated on the GUI for general review and		

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#	Minimum Specifications	Bidder Compliance (Yes/No)	Product Documentation Reference
	also for pre- and post-alarm recording display.		
15.	The solution design for the VMS shall provide flexible video signal compression, display, storage and retrieval.		
16.	All CCTV camera video signal inputs to the system shall be provided to various command control center(s), viewing center etc., and the transmission medium used shall best suit the relative camera deployments and access to the CCTV Network.		
17.	VMS client shall have the capability to work with touch enabled multi-monitor workstations. It shall be capable of displaying videos in up to three (3) monitors simultaneously.		
a.	AVI files		
b.	Motion- Joint Photographic Experts Group (M-JPEG)		
c.	Moving Picture Expert Group-4 (MPEG-4)		
d.	MP4 Export or Latest		
18.	All streams to the above locations shall be available in real-time and at full resolution. Resolution and other related parameters shall be configurable by the administrator in		

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#	Minimum Specifications	Bidder Compliance (Yes/No)	Product Documentation Reference
	order to provide for network constraints.		
19.	The VMS shall support field sensor settings. Each channel configured in the VMS shall have an individual setup for the following settings, the specific settings shall be determined according to the encoding device:		
20.	The VMS shall support the following operations:		
a.	Adding an IP device		
b.	Updating an IP device		
c.	Updating basic device parameters		
d.	Adding/removing channels		
e.	Adding/removing output signals		
f.	Updating an IP channel		
g.	Removing an IP device		
h.	Enabling/disabling an IP channel		
i.	Refreshing an IP device (in case of firmware upgrade)		
j.	Multicast at multiple aggregation points		
21.	The VMS shall support retrieving data from edge storage. Thus when a lost or broken connection is restored, it shall be possible to		

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#	Minimum Specifications	Bidder Compliance (Yes/No)	Product Documentation Reference
	retrieve the video from SD card and store it on central storage. System should support to view the recordings available over cameras local storage device (such as an SD card), and copy them to the server.		
22.	The VMS shall support bookmarking the videos. Thus, allowing the users to mark incidents on live and/or playback video streams.		
23.	The VMS shall allow the administrator to distribute camera load across multiple recorders and be able shift the cameras from one recorder to another by simple drag and drop facility.		
24.	VMS shall support automatic failover for recording.		
25.	VMS should also support dual recording or mirroring if required.		
26.	VMS shall support manual failover for maintenance purpose.		
27.	VMS shall support access and view of cameras and views on a smartphone or a tablet (a mobile device).		
28.	VMS shall support integration with the ANPR application.		
29.	VMS shall support integration with other online and offline video analytic applications.		

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#	Minimum Specifications	Bidder Compliance (Yes/No)	Product Documentation Reference
30.	VMS shall be able to accept alerts from video analytics built into the cameras, other third party systems, sensors etc.		

### **Client System**

The Client system shall provide remote users with rich functionality and features as described below:

#	Minimum Specifications	Bidder Compliance (Yes/No)
1.	Viewing live video from cameras on the surveillance system.	
2.	Browsing recordings from storage systems.	
3.	Creating and switching between multiple of views.	
4.	Viewing video from selected cameras in greater magnification and/or higher quality in a designated hotspot.	
5.	Using digital zoom on live as well as recorded video.	
6.	Using sound notifications for attracting attention to detected motion or events.	
7.	Getting quick overview of sequences with detected motion.	
8.	Getting quick overviews of detected alerts or events.	
9.	Quickly searching selected areas of video recording for motion (also known as Smart Search).	

### **Remote Web Client**

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#	Minimum Specifications	Bidder Compliance (Yes/No)
1.	The web-based remote client shall offer live view of up to 9 cameras, including PTZ control (if applicable) and event / output activation. The Playback function shall give the user concurrent playback of multiple recorded videos with date, alert sequence or time searching.	
2.	User Authentication – The Remote Client shall support logon using the user name and password credentials	

**Mobile Client**

#	Minimum Specifications	Bidder Compliance (Yes/No)
1.	The bidder shall be required to provide a standardized Mobile Application to integrate smart phones and tablets for 2-way communication with the Video Management System in a secure manner. It shall be responsibility of MSI to configure such tablets / Smartphone with the Surveillance System and ensure that all the necessary access is given to these mobile users.	
2.	Communication with mobile client and server shall be encrypted with Digital Certificate.	

**Matrix Monitor**

#	Minimum Specifications	Bidder Compliance (Yes/No)
1.	Matrix Monitor – The Matrix Monitor feature shall allow distributed viewing of multiple cameras on the system on any monitor.	
2.	The Matrix Monitor feature shall access the H.264/MJPEG/MPEG4 stream from the connected camera directly and not sourced through the recording server.	

**Alarm Management Module**



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#	Minimum Specifications	Bidder Compliance (Yes/No)
1.	The alarm management module shall allow for continuous monitoring of the operational status and event-triggered alarms from various system servers, cameras and other devices. The alarm management module shall provide a real-time overview of alarm status or technical problems while allowing for immediate visual verification and troubleshooting.	
2.	The alarm management module shall provide interface and navigational tools through the client including;	
3.	Graphical overview of the operational status and alarms from servers, network cameras and external devices including motion detectors and access control systems.	
4.	Intuitive navigation using a map-based, hierarchical structure with hyperlinks to other maps, servers and devices or through a tree-view format.	
5.	The module shall include flexible access rights and allow each user to be assigned several roles where each shall define access rights to cameras.	
6.	Basic VMS should be capable to accept third party generated events / triggers.	

**Management / Integration Functionality**

#	Minimum Specifications	Bidder Compliance (Yes/No)
1.	The Surveillance System shall offer centralized management of all devices, servers and users.	
2.	The Surveillance System should not have any limit on the number of cameras to be connected for Surveillance, Monitoring and Recording. Any increase in the no. of cameras should be possible by augmentation of Hardware components.	

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3.	The Surveillance System shall support distributed viewing of any camera in the system using Video walls or big screen displays.	
4.	The Surveillance System shall support alarm management. The alarm management shall allow for the continuous monitoring of the operational status and event-triggered alarms from system servers, cameras and other external devices.	
5.	It should be possible to integrate the Surveillance System with 3rd-party software, to enable the users to develop customized applications for enhancing the use of video surveillance solution. For e.g., integrating alarm management to initiate SMS, E-Mail, VoIP call, etc.	
6.	The Management system shall store the overall network elements configuration in central database, either on the management server computer or on a separate DB Server on the network.	
7.	System should be able to be integrated with Event Management / Incident Management System.	

**System Administration Functionality**

#	Minimum Specifications	Bidder Compliance (Yes/No)
1.	The System Administration Server shall provide a feature-rich administration client for system configuration and day-to-day administration of the system.	
2.	<p>The System Administration Server shall support different logs related to the Management Server.</p> <ul style="list-style-type: none"> <li>• The System Log</li> <li>• The Audit Log</li> <li>• The Alert Log</li> <li>• The Event Log</li> </ul>	
3.	Rules: The system shall support the use of rules to determine when specific actions occur. Rules shall define what actions	

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#	Minimum Specifications	Bidder Compliance (Yes/No)
	<p>shall be carried out under specific conditions. The system shall support rule initiated actions such as:</p> <ul style="list-style-type: none"> <li>• Start and stop recording</li> <li>• Set non-default live frame rate</li> <li>• Send notifications via email</li> <li>• Pop-up video on designated Client Monitor recipients</li> </ul>	

**Other Miscellaneous Requirements**

#	Minimum Specifications	Bidder Compliance (Yes/No)
1.	System should have a facility to create CDs or other storage media for submission to Judiciary, which can be treated evidence for legal matters. Such storage media creation should be tamper proof and MSI to provide appropriate technology so that integrity and quality of evidence is maintained as per requirements of the judiciary. Bidder is required to specify any additional hardware / software required for this purpose & the same can be listed in Miscellaneous section of the commercial bid. The bidder shall also prepare the guideline document to be followed by the Police Personnel for the retrieval of Video / images from the CCTV System so as to maintain integrity of the evidence. Such a guideline document should include methods of retrieval of data, check-list to be followed and flowchart of the entire process to be followed.	
2.	All the systems proposed and operationalization of Video Management System should comply with requirements of IT Acts.	
3.	Security Platform shall have strong security mechanism such as the use of advance encryption/digital certificates/authentication to ensure that only authorized personnel have access to critical information, prevent man-in-the-middle attacks, and that the data is kept private.	
4.	System should ensure that once recorded, the video cannot be altered, ensuring the audit trail is intact for evidential purposes.	

**Major Server components for VMS**

<b>Video Management Server(s)</b>	Video Management System Servers shall maintain coherent operations between all servers and workstations. It shall host Control Center, where the system is administered, and System database. It shall monitor one or more Recorder servers on separate dedicated computers, storage devices, IP-compatible devices, and one or more workstation. All network communication shall also be performed via the Video Management servers.
<b>Video Recording Server(s)</b>	The Video Recorder Server shall be a dedicated server that shall store and processes video with the help of Video Management System
<b>Video Analytics Server (s)</b>	Video Analytics Software shall be installed in the Video Analytics Server, Video Analytics is a software product that shall analyse live video in real-time to detect, identify, and track objects of interest. It shall automatically issue alerts to the appropriate personnel and initiate appropriate follow-up action according to pre-defined rules. This software shall also manage sensors; each sensor shall monitor a single video feed for security events. The video feeds shall be connected over the network to the Video Analytics Server. Sensors on the Video Analytics Server shall perform all event detection functions.
<b>Web Server(s)</b>	It shall be used to launch the client application remotely through web browsers.
<b>Gateway Server (s) - If required</b>	A Media Gateway server shall be used to establish remote connections to review and transcode the video. Standalone Media Gateway servers shall also be installed on separate machines. Standalone servers shall be recommended for such large systems that shall transfer video data to remote clients.

### **6.3. Traffic Enforcement System**

The functional requirements and technical specifications provided in the below sections and at other sections in this RFP are indicative and carry guiding rule. The MSI is free to offer products and solutions which meet requirements of the RFP focusing on the outcome, future scalability, security, reliability and adherence to specified SLA under this RFP, in line with applicable standards & best practices adopted in the industry. The MSI is encouraged to design an Optimized solution which is technically superior, innovative, proven, better in terms of functionality and is cost effective. Any specified parameters mentioned in the scope/technical requirement in the RFP may be considered if it is required for meeting current & future requirements during the contract period. The MSI is fully responsible for the specified outcome to be achieved.

#### **6.3.1.1. Functional Requirements of the Red Light Violation Detection System**

#	Minimum Specifications	Bidder Compliance (Yes/No)	Product Documentation Reference
1	<b>Make</b>	<to be provided by the bidder>	
2	<b>Model</b>	<to be provided by the bidder>	
3	<b>General</b>		

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#	Minimum Specifications	Bidder Compliance (Yes/No)	Product Documentation Reference
a.	<p>The following Traffic violations to be automatically detected by the system by using appropriate Non-Intrusive sensors technology: The system should have both provisions to detect red light status by taking the signal feed from the traffic signal controller as well as by video analytics method using another camera (Evidence Camera) focused at the red light. The Evidence camera should also be used for evidence snap generation.</p> <p>a) Red Light Violation b) Stop Line Violation</p>		
b.	<p>The system should be capable of capturing multiple infracting vehicles simultaneously in Different lanes on each arm at any point of time with relevant infraction data like:</p> <p>a) Type of Violation b) Date, time, Site Name and Location of the Infraction c) Registration Number of the vehicle through ANPR Camera system for each vehicle identified for infraction.</p>		
c.	<p>The system should be equipped with a camera system to record a digitized image and video of the violation, covering the violating vehicle with its surrounding and current state of signal (Red/Green/Amber) by which the system should clearly show nature of violation and proof thereof :-</p> <p>a) When it violates the stop line. b) When it violates the red signal. c) Besides, a closer view indicating readable registration number plate patch of the violating vehicle for court evidence for each violation.</p> <p>The system shall have in-built tool to facilitate the user to compose detail evidence by stitching video clips from any IP camera in the junction (including but not limited to the red light violation detection camera, evidence camera), and any other surveillance cameras in the vicinity of the spot of incidence. The entire evidence should be</p>		

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#	Minimum Specifications	Bidder Compliance (Yes/No)	Product Documentation Reference
	watermarked and encrypted to stand the court of law.		
d.	The system shall be able to detect all vehicles infracting simultaneously in each lane/ arm at the junction as per locations provided. It should also be able to detect the vehicles infracting serially one after another in the same lane. The vehicles should be clearly identifiable and demarcated in the image produced by the camera system.		
e.	The Evidence image produced by the system should be wide enough to give the exact position of the infracting vehicles with respect to the stop line and clearly indicate colour of the Traffic light at the instant of Infraction even if any other means is being used to report the colour of the light.		
f.	The system should interface with the traffic controller to validate the colour of the traffic signal reported at the time of Infraction so as to give correct inputs of the signal cycle.		
g.	The Evidence and ANPR camera should continuously record all footage in its field of view to be stored at the local base station. This should be extractable onto a portable device as and when required. The option of live viewing of evidence cameras from the locations shall be available at the ICCC. The network should have the capability to provide the real time feed of the evidence camera to the ICCC at the best resolution possible on the available network.		
h.	The system shall be equipped with IR Illuminator to ensure clear images including illumination of the Number Plate and capture the violation image under low light conditions and night time.		

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#	Minimum Specifications	Bidder Compliance (Yes/No)	Product Documentation Reference
<b>4</b>	<b>Recording &amp; display information archive medium</b>		
a.	The recording and display of information should be detailed on the snapshot of the infracting vehicle as follows:		
b.	Computer generated unique ID of each violation		
c.	Date (DD/MM/YYYY)		
d.	Time (HH:MM:SS)		
e.	Equipment ID		
f.	Location ID		
g.	Carriageway or direction of violating vehicle		
h.	Type of Violation (Signal/Stop Line)		
i.	Lane Number of violating vehicle		
j.	Time into Red/Green/Amber		
k.	Registration Number of violating vehicle		
<b>5</b>	<b>On site-out station processing unit communication &amp; Electrical Interface</b>		
a.	The system should automatically reset in the event of a program hang up and restart on a button press. However the system should start automatically after power failure.		
b.	The system should have secure access mechanism for validation of authorised personnel.		
c.	Deletion or addition and transfer of data should only be permitted to authorised users.		
d.	A log of all user activities should be maintained in the system.		
e.	Roles and Rights of users should be defined in the system as per the requirements of the client		
f.	All formats of the stored data with respect to the infractions should be Non Proprietary.		
g.	The communication between the on-site outstation processing unit housed in the junction box and the detection systems mounted on the cantilever shall be through appropriate secured technology.		
h.	The system should have the capability to transfer the data to CCCs/ICCC through proper encryption in real time and batch mode for verification of the infraction and processing of challan. Call forwarding		

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#	Minimum Specifications	Bidder Compliance (Yes/No)	Product Documentation Reference
	architecture shall be followed to avoid any data loss during transfer.		
i.	In the event that the connectivity to the CCCs/ICCC is not established due to network/connectivity failures, then all data pertaining to the infraction shall be stored on site and shall be transferred once the connectivity is re-established automatically. There shall also be a facility of physical transfer of data on portable device whenever required. There should be a provision to store minimum <b>one week</b> of data at each site on a 24x7 basis.		
<b>6</b>	<b>Mounting structure</b>		
a.	Should be cantilever mounted and shall have minimum 6 Mtrs. height with appropriate vertical clearance under the system from the Road surface to ensure no obstruction to vehicular traffic.		
b.	It should be capable to withstand high wind speeds and for structural safety, the successful bidder has to provide structural safety certificate from qualified structural engineers approved/ certified by Govt. Agency.		
c.	It shall be painted with one coat of primer and two coats of PU paint. The equipment including poles, mountings should have an aesthetic feel keeping in mind the standards road Infrastructure (e.g. Poles, Navigation boards etc.) currently installed at these locations. The equipment should look “one” with the surroundings of the location and not look out of place.		
d.	Rugged locking mechanism should be provided for the onsite enclosures and cabinets.		
<b>7</b>	<b>RLVD Application</b>		
a.	It should be capable of importing violation data for storage in database server which should also be available to the Operator for viewing and retrieving the violation images and data for further processing. The programme should allow for		



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#	Minimum Specifications	Bidder Compliance (Yes/No)	Product Documentation Reference
	viewing, sorting, transfer & printing of violation data.		
b.	It should generate the photograph of violations captured by the outstation system which include a wider view covering the violating vehicle with its surrounding and a closer view indicating readable registration number plate patch of the violating vehicle or its web link on notices for court evidence.		
c.	All outstation units should be configurable using the software at the Central Location.		
d.	Violation retrieval should be sorted by date, time, location and vehicle registration number and the data structure should be compatible with UP/Allahabad Police database structure. It should also be possible to carry out recursive search and wild card search.		
e.	The operator at the back office should be able to get an alarm of all fault(s) occurring at the camera site (e.g. sensor failure, camera failure, failure of linkage with traffic signal, connectivity failure, Camera tampering, sensor tampering).		
f.	The automatic number plate recognition Software shall be part of the supplied system, Success rate of ANPR shall be taken as 80% or better during the day time and 60% or better during the night time with a standard number plate.		
g.	The application software should be integrated with the E-Challan software for tracing the ownership details of the violating vehicle and issuing/printing notices. Any updates of the software (OS, Application Software including any proprietary software), shall be updated free of cost during the contract period by the MSI.		
h.	Image zoom function for number plate and images should be provided. In case the number plate of the infracting vehicle is readable only through the magnifier then in such cases the printing should be possible along with the magnified image.		

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#	Minimum Specifications	Bidder Compliance (Yes/No)	Product Documentation Reference
i.	Various users should be able to access the system using single sign on and should be role based. Different roles which should be defined (to be finalized at the stage of SRS) could be Administrator, Supervisor, Officer, Operator, etc.		
j.	Apart from role based access, the system should also be able to define access based on location.		
k.	Rights to different modules / Sub-Modules / Functionalities should be role based and proper log report should be maintained by the system for such access.		
l.	Components of the architecture should provide redundancy and ensure that there are no single points of failure in the key project components. Considering the high sensitivity of the system, design shall be in such a way as to be resilient to technological sabotage. To take care of remote failure, the systems need to be configured to mask and recover with minimum outage.		
m.	The architecture should adopt an end-to-end security model that protects data and the infrastructure from malicious attacks, theft etc. Provisions for security of field equipment as well as protection of the software system from hackers and other threats shall be a part of the proposed system. Using Firewalls and Intrusion detection systems such attacks and theft shall be controlled and well supported (and implemented) with the security policy. The virus and worms attacks shall be well defended with Gateway level Anti-virus system, along with workstation level Anti-virus mechanism. There shall also be an endeavour to make use of the SSL/VPN technologies to have secured communication between Applications and its end users. Furthermore, all the system logs shall be properly stored & archived for future analysis and forensics whenever desired.		
n.	The evidence of Infraction should be encrypted and protected so that any tampering can be detected.		

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#	Minimum Specifications	Bidder Compliance (Yes/No)	Product Documentation Reference
o.	Ease of configuration, ongoing health monitoring, and failure detection are vital to the goals of scalability, availability, and security and must be able to match the growth of the environment.		
p.	System shall use open standards and protocols to the extent possible and declare the proprietary software wherever used.		
q.	The user interface should be user friendly and provide facility to user for viewing, sorting and printing violations. The software should also be capable of generating query based statistical reports on the violation data.		
r.	The data provided for authentication of violations should be in an easy to use format as per the requirements of user.		
s.	User should be provided with means of listing the invalid violations along with the reason(s) of invalidation without deleting the record(s).		
t.	Basic image manipulation tools (zoom etc.) should be provided for the displayed image but the actual recorded image should never change.		
u.	Log of user actions be maintained in read only mode. User should be provided with the password and ID to access the system along with user type (admin, user).		
v.	Image should have a header/footer depicting the information about the site IP and violation details like date, time, equipment ID, location ID, Unique ID of each violation, lane number, Regn. Number of violating vehicle and actual violation of violating vehicle etc. so that the complete lane wise junction behavior is recorded including (Red Light violation and Stop Line Violation)		
w.	Number plate should be readable automatically by the software/interface. There should be user interface for simultaneous manual authentication / correction and saving as well.		
x.	Interface for taking prints of the violations (including image and above details).		

**6.3.1.2. Functional Requirement: E Challan System application**

#	Minimum Requirements	Bidder Compliance(Yes/No)	Product Documentation Reference
<b>A.</b>	<b>Make</b>	<to be provided by the bidder>	
<b>B.</b>	<b>Model</b>	<to be provided by the bidder>	
<b>C.</b>	<b>General</b>		
1.	E-challan software shall work in client - server mode, where 30 handheld devices units shall act as clients connected to the server through cellular network for data transfer. The system should be scalable to 500 devices, which may be added later on, server requirements to be calculated as per scalability for 500 devices, which may be added later on.		
2.	E-challan system shall be able to retrieve vehicle owners details and vehicle data from RTO data base to minimise data entry		
3.	Server should maintain log of all current devices. Any access to the system must be recorded along with date, time, user id and IP address		
4.	Traffic officer should log in to the hand held device through the unique user id and pass word or smart card issued for the purpose		
5.	A unique challan number should be generated through client software for each challan		
6.	As soon as a vehicle registration number is entered , the handheld device should automatically check from the server if the vehicle is stolen , wanted in any criminal case or is in the list of suspicious vehicle		
7.	The most frequent traffic offences should be kept at the top in the drop down menu and offence ingredients should be available if required by officer		

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#	Minimum Requirements	Bidder Compliance(Yes/No)	Product Documentation Reference
8.	Date, time and GPS coordinates of place of challan should be automatically populated in the relevant fields of client software		
9.	Compounding amount must populate in the field automatically from master table		
10.	The successful bidder should develop the GUI and functionality as per requirements of the Allahabad Police		
11.	The GUI should be lingual i.e. English and local state language		
12.	It should be possible to integrate payment gate way operator with the system for felicitation of payment		
<b>D.</b>	<b>Handheld Device Software</b>		
13.	Once the application is loaded on the hand-held device there should be no possibilities to modify the application by the user. Reloading and modifying of application should be possible only by an administrator.		
14.	On switching on the hand-held device the system must give access only after validation through user ID and password.		
15.	The communication between the server and hand-held device would be through GSM/GPRS/ 3G/4G or better connectivity etc.		
16.	Every challan created should have a unique self-populated number.		
17.	The Handheld application shall be able to access information from the main Server and display upon request, pop- up tables/codes, vehicle and license details, all types of offences, compounding amount, challan types, vehicle details, court calendar		

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#	Minimum Requirements	Bidder Compliance(Yes/No)	Product Documentation Reference
	etc. in order to minimize the typing by the prosecuting officer.		
18.	The Handheld device should be able to access data/ information on the basis of driving license number, vehicle registration number etc. from the main server data relating to previous offences.		
19.	The hand-held application software should also suggest date of challan, place of challan, name of the Court and court date etc. to further reduce typing by the officer. These fields should be designed in consultation with Allahabad Police.		
20.	When a challan is issued, the name and ID of the officer should be printed on the challan.		
21.	The Handheld device shall be able to input and print multiple offences on the same challan.		
22.	The Handheld software shall validate challan fields automatically before the challan is printed. The system shall ensure that certain fields are properly completed before allowing the challan to be printed.		
23.	When downloading application software or pop-up tables or lists to the Handheld, or uploading challan records to the Server, synchronization of Handheld system must be automatic, in order to minimize human intervention.		
24.	Uploading data to the Database Server should be automatic in consistent manner.		
25.	The application should provide features wherein when a driving license/ vehicle registration number is entered; it should be able to pull from the server all the details relating to the driving license holder/		

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#	Minimum Requirements	Bidder Compliance(Yes/No)	Product Documentation Reference
	vehicle owner including history of previous offences.		
26.	Software should capture the list of documents seized during prosecution and such list must be reflected on the printed court challan.		
27.	The handheld application software shall allow the user to generate a summary report to facilitate evaluation of his daily work.		
28.	Once the challan is complete and saved any further editing should not be possible unless so authorized by administrator.		
29.	Each hand-held device should be provided with original printed user manual and appropriate carry case for Handheld device with charger.		
30.	The application software should allow online payment		
31.	There should be automatic rejection of payment for the settlement of expired notices or challans. Partial payment of an offence shall not be accepted by the system.		
32.	The software should update DL/RC smart card with the booked offence.		
<b>E.</b>	<b>E-Challan Application Software</b>		
33.	The Application Software should work in a web based environment.		
34.	The application software should be user friendly, easy to operate even by police personnel with minimum qualification of that of a head constable.		

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#	Minimum Requirements	Bidder Compliance(Yes/No)	Product Documentation Reference
35.	The software shall provide comprehensive data back-up and restoration capability.		
36.	The system shall function in web-based system where the hand-held device shall work as a node.		
37.	The application software should maintain the logs of user activities to facilitate the audit trail.		
38.	The system should have sufficient security features such as biometrics, password protection, audit trail, etc.		
39.	The system should be able to handle the activities of all the handheld devices at one time simultaneously with huge database size of prosecution, ownerships, driving license etc. without affecting the performance.		
40.	The software should be able to generate various periodical reports, summaries, MIS reports, query reply etc. as per the requirements of Allahabad Police.		
41.	Administrator should be able to modify the master tables as and when required and should have the capability to push the changes to hand-held devices.		
42.	Software up-gradation should be provided by the MSI from time to time as per available technology without further cost impact to Allahabad Police.		
43.	The Department shall provide the entire data of vehicle ownership and driving license for integration with the MSI's application software.		



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#	Minimum Requirements	Bidder Compliance(Yes/No)	Product Documentation Reference
44.	All database tables, records etc. required for various dropdown menus etc. shall also be created by the MSI.		
45.	The application software shall be provided by the MSI to handle various processes of the prosecution required by the office of senior police officers, Courts etc.		
46.	The application software should have the capability to export records in CSV, SQL and binary format		

**6.3.1.3. Technical Specifications: Red Light Violation Detection Systems**

#	Parameter	Minimum Specifications	Bidder Compliance (Yes/No) (Yes/No)	Product Documentation Reference
1.	<b>Make</b>	<to be provided by the bidder>		
2.	<b>Model</b>	<to be provided by the bidder>		
3.	<b>General</b>			
	The system should be capable of generating a video & minimum 3 snapshot in any of the standard industry formats (MJPEG, JPG, avi, mp4, mov, etc.) with at least 10 frames per second. The video shall be from t-5 to t+5 sec of the violation and should also be recorded (being the instant at which the infraction occurred).			
4.	<b>Digital Network Camera</b>			
a.	Video Compression	H.264		
b.	Video Resolution	1920 X 1080		
c.	Frame rate	Min. 30 fps		
d.	Image Sensor	1/3" Progressive Scan CCD / CMOS		
e.	Lens Type	Varifocal, C/CS Mount, IR Correction full HD lens		
f.	Lens#	Auto IRIS 5~50mm /8 – 40 mm, F1.4		

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#	Parameter	Minimum Specifications	Bidder Compliance (Yes/No) (Yes/No)	Product Documentation Reference
g.	Minimum Illumination	Colour: 0.5 lux, B/W: 0.1 lux (at 30 IRE)		
h.	IR Cut Filter	Automatically Removable IR-cut filter		
i.	Day/Night Mode	Colour, Mono, Auto		
j.	S/N Ratio	≥ 50 Db		
k.	Auto adjustment + Remote Control of Image settings	Colour, brightness, sharpness, contrast, white balance, exposure control, backlight compensation, Gain Control, True Wide Dynamic Range		
l.	Local storage	Minimum 64 GB Memory card in a Memory card slot. In the event of failure of connectivity to the central server the camera shall record video locally on the SD card automatically. After the connectivity is restored these recordings shall be automatically merged with the server recording such that no manual intervention is required to transfer the SD card based recordings to server.		
m.	Protocol	IPV4, IPV6, HTTP, HTTPS, FTP/SMTP, RTSP, RTP, TCP, UDP, RTCP, DHCP, UPnP, NTP, QoS, ONVIF Profile S		
n.	Security	Password Protection, IP Address filtering, User Access Log, HTTPS encryption		
o.	Operating conditions	As per Allahabad weather conditions		
p.	Casing	NEMA 4X / IP-66, IK10 rated		
q.	Intelligent Video	Motion Detection & Tampering alert		

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#	Parameter	Minimum Specifications	Bidder Compliance (Yes/No) (Yes/No)	Product Documentation Reference
r.	Alarm I/O	Minimum 2 Input & 1 Output contact for 3 <sup>rd</sup> part interface		
s.	Certification	UL/EN, CE,FCC		
<b>5.</b>	<b>On site-out station processing unit communication &amp; Electrical Interface (Junction Box)</b>			
a.	Data Storage on site	The system should be equipped with appropriate storage capacity for 7 days 24X7 recording, with overwriting capability. The images should be stored in tamper proof format only.		
b.	Network Connectivity	Wired/GPRS based wireless technology with 3G upgradable to 4G capability.		
c.	Minimum 2(two) USB Port to support the latest external mass storage devices and Ethernet (10/100) Port for possible networking. However all logs of data transfer through the ports shall be maintained by the system.			
d.	The system should be capable of working in ambient temperature as per Allahabad weather conditions.			
e.	Lightening arrester shall be installed for safety of system (As per BIS standard IS 2309 of 1989).			
f.	The housing(s) should be capable of withstanding vandalism and harsh weather conditions and should meet IP66, IK10 standards (certified).			
<b>6.</b>	<b>Violation Transmission and Security</b>			

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#	Parameter	Minimum Specifications	Bidder Compliance (Yes/No) (Yes/No)	Product Documentation Reference
a.	Encrypted data, images and video pertaining to Violations at the Onsite processing station should be transmitted to the CCCs/ICCC electronically through GPRS based wireless technology with 3G upgradable to 4G, or wired connectivity if available in Jpeg format			
b.	Advanced Encryption Standard (AES) shall be followed for data encryption on site and CCCs/ICCC, and its access shall protected by a password.			
c.	The MSI shall ensure that the data from the onsite processing unit shall be transferred to CCCs/ICCC within one day.			
<b>7.</b>	<b>Video Recording</b>			
a.	The system should be capable of continuous video recording in base station for 7 days. The system shall automatically overwrite the data after 7 days. It should be noted that at any point of time the local storage at the base station should have the data of previous 7 days.			
b.	Direct extraction through any physical device like USB flash drive , Portable Hard disk etc. shall be possible			

**6.3.1.4. Technical Specifications: E Challan Handheld device**

Sr. No.	Parameter	Minimum Specifications	Bidder Compliance (Yes/No)	Product Documentation Reference
<b>1</b>	<b>Make</b>	<to be provided by the bidder>		
<b>2</b>	<b>Model</b>	<to be provided by the bidder>		
<b>3</b>	<b>Core Board</b>			

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Sr. No.	Parameter	Minimum Specifications	Bidder Compliance (Yes/No)	Product Documentation Reference
A	Operating System	Latest Windows, Linux or Android OS		
B	Processor	Min 800 MHz or better		
C	Memory (Flash ROM)	Minimum 512 MB or better		
D	RAM	256 MB or better		
E	Extend Slot	Micro SD 32 GB or better		
<b>4</b>	<b>Motherboard</b>			
A	Display	Minimum 3.5 inch TFT LCD (Trans reflective screen VGA/QVGA) or better		
B	Touch Screen	Yes		
C	Form Factor	Any		
D	GPS	GPS and A GPS		
E	Bluetooth	Yes		
F	Wi-Fi	Wi-Fi (802.11 b/g/n)		
G	Thermal Printer	Direct thermal line printing 3 inch		
H	Barcode scanner	1D and 2 Scanner		
I	External Interface	USB HOST/RS232(Cust omized)		
J	Protection class	IP54		

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Sr. No.	Parameter	Minimum Specifications	Bidder Compliance (Yes/No)	Product Documentation Reference
K	Drop resistance level	1.5m		
<b>5</b>	<b>Camera</b>			
A	Camera	3 MP Min		
B	Camera- Video	Support still image and video capture		
<b>6</b>	<b>Keypad</b>			
A	Front	QWERTY 42 Keys function key can be soft key		
<b>7</b>	<b>Interface</b>			
A	Mini-USB Connector	USB2.0 connection		
B	SIM card slot	Yes		
C	TF card slot	Yes		
D	power jack	Yes		
E	Audio Jack	Yes		
<b>8</b>	<b>General</b>			
A	Battery Type	Rechargeable Li-ion battery 3000mAh		
B	Operating temperature	As per Allahabad weather conditions		
C	Storage temperature	As per Allahabad weather conditions		
D	Operating humidity	As per Allahabad weather conditions		
E	Storage humidity	As per Allahabad weather conditions		

Sr. No.	Parameter	Minimum Specifications	Bidder Compliance (Yes/No)	Product Documentation Reference
F	Payment PINPAD	The device should have LPCI , EMV certified PINPAD as per RBI guideline for accepting payment through Credit / Debit card		
G	Enclosure	Rugged		

#### **6.4. Variable Message Display (VMD) System**

The functional requirements and technical specifications provided in the below sections and at other sections in this RFP are indicative and carry guiding rule. The MSI is free to offer products and solutions which meet requirements of the RFP focusing on the outcome, future scalability, security, reliability and adherence to specified SLA under this RFP, in line with applicable standards & best practices adopted in the industry. The MSI is encouraged to design an Optimized solution which is technically superior, innovative, proven, better in terms of functionality and is cost effective. Any specified parameters mentioned in the scope/technical requirement in the RFP may be considered if it is required for meeting current & future requirements during the contract period. The MSI is fully responsible for the specified outcome to be achieved.

##### **6.4.1. Functional Requirements of the Variable Message Display (VMD) System**

#	Minimum Specifications	Bidder Compliance (Yes/No)	Product Documentation Reference
1	<b>Make</b>	<to be provided by the bidder>	
2	<b>Model</b>	<to be provided by the bidder>	
3	<b>System Requirements</b>		
a.	The system should be capable to display warnings, traffic advice, route guidance and emergency messages to motorists from the CCCs/ICCC in real time.		
b.	The system should also be capable to display warnings, traffic advice, route guidance and emergency messages to motorist by using local PC/Laptops.		

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#	Minimum Specifications	Bidder Compliance (Yes/No)	Product Documentation Reference
c.	The VMD should display text and graphic messages using Light Emitting Diode (LED) arrays.		
d.	The System should able to display failure status of any LED at CCCs/ICCC.		
e.	The System should support Display characters in true type fonts and adjustable based on the Operating system requirement.		
f.	The VMD workstation at the CCCs/ICCC should communicate with the VMD controller through the network. It should send out command data to the variable message display controller and to confirm normal operation of the signboard. In return, the VMD workstation should receive status data from the VMD controller.		
g.	VMD controllers should continuously monitor the operation of the VMD via the provided communication network.		
h.	Operating status of the variable message display should be checked periodically from the CCCs/ICCC.		
i.	It shall be capable of setting an individual VMD or group of VMD's to display either one of the pre-set messages or symbols entered into the computer via the control computer keyboard or by another means.		
j.	It shall be capable of being programmed to display an individual message to a VMD or a group of VMD's at a pre-set date and time.		
k.	A sequence of a minimum of 10 messages/pictures/ pre-decided sign or group of signs shall be possible to assign for individual VMD or group of VMD's.		
l.	It shall also store information about the time log of message displayed on each VMD. The information stored shall contain the identification number of the VMD, content of the message, date and time at which displayed message/picture starts and ends.		



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#	Minimum Specifications	Bidder Compliance (Yes/No)	Product Documentation Reference
m.	The central control computer shall perform regular tests (pre-set basis) for each individual VMD. Data communication shall be provided with sufficient security check to avoid unauthorized access.		
<b>4</b>	<b>Variable Message Displays (VMD) application</b>		
a.	Central Control Software allows controlling multiple VMD from one console.		
b.	Capable of programming to display all types of Message/ advertisement having alphanumeric character in English, Hindi and combination of text with pictograms signs. The system should have feature to manage video / still content for VMD. The system should have capability to divide VMD screen into multi-parts to display diverse form of information like video, text, still images, advertisements, weather info, city info etc. The system should also provide airtime management and billing system for paid content management		
c.	Capable of controlling and displaying messages on VMD boards as individual/ group.		
d.	Capable of controlling and displaying multiple font types with flexible size and picture sizes suitable as per the size of the VMD.		
e.	Capable of controlling brightness & contrast through software.		
f.	Capable to continuously monitor the operation of the Variable Message Display board, implemented control commands and communicate information to the CCCs/ICCC via communication network.		
g.	Real-time log facility – log file documenting the actual sequence of display to be available at central control system.		

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#	Minimum Specifications	Bidder Compliance (Yes/No)	Product Documentation Reference
h.	Multilevel event log with time & date stamp.		
i.	Access to system only after the authentication and acceptance of authentication based on hardware dongle with its log.		
j.	Location of each VMD shall be plotted on GIS Map with their functioning status which can be automatically updated.		
k.	Report generation facility for individual/group/all VMDs with date and time which includes summary of messages, dynamic changes, fault/repair report and system accessed logs, link breakage logs, down time reports or any other customized report.		
l.	Configurable scheduler on date/day of week basis for transmitting pre-programmed message to any VMD unit.		
m.	Various users should access the system using single sign on and should be role based. Different roles which could be defined (to be finalized at the stage of SRS) could be Administrator, Supervisor, Officer, Operator, etc.		
n.	Apart from role based access, the system should also be able to define access based on location.		
o.	Rights to different modules / Sub-Modules / Functionalities should be role based and proper log report should be maintained by the system for such access		
p.	Components of the architecture should provide redundancy and ensure that there are no single points of failure in the key project components. To take care of remote failure, the systems need to be configured to mask and recover with minimum outage.		
q.	The architecture should adopt an end-to-end security model that protects data and the		

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#	Minimum Specifications	Bidder Compliance (Yes/No)	Product Documentation Reference
	infrastructure from malicious attacks, theft, natural disasters etc. provisions for security of field equipment as well as protection of the software system from hackers and other threats shall be a part of the proposed system. Using Firewalls and Intrusion detection systems such attacks and theft shall be controlled and well supported (and implemented) with the security policy. The virus and worms attacks shall be well defended with Gateway level Anti-virus system, along with workstation level Anti-virus mechanism. There shall also be an endeavour to make use of the SSL/VPN technologies to have secured communication between Applications and its end users. Furthermore, all the system logs shall be properly stored & archived for future analysis and forensics whenever desired.		
r.	Ease of configuration, ongoing health monitoring, and failure detection are vital to the goals of scalability, availability, and security and should be able to match the growth of the environment.		
s.	System shall use open standards and protocols to the extent possible		
t.	Facility to export reports to excel and PDF formats.		
<b>3.</b>	<b>Remote Monitoring</b>		
a.	All VMD shall be connected/configured to CCCs/ICCC for remote monitoring through network for two way communication between VMD and control Room to check system failure, power failure & link breakage.		
b.	Remote Diagnostics to allow identifying failure up to the level of failed individual LED.		

#### 6.4.2. Technical Specifications: Variable Message Display (VMD) System

#	Parameter	Minimum Specifications	Bidder Compliance (Yes/No)	Product Documentation Reference
1.	<b>Make</b>		<to be provided by the bidder>	
2.	<b>Model</b>		<to be provided by the bidder>	
3.	<b>Dimensions</b>			
A	Minimum 3.0m length X 1.5m height X 0.2m depth. (3000mm x 1500mm X 200mm approx.)			
4.	<b>Colour LED</b>	Full Colour, class designation C2 as per IRC/EN 12966 standard		
5.	<b>Luminance Class/Ratio</b>	L3 as per IRC/EN 12966 standards.		
6.	<b>Luminance Control &amp; auto Diming</b>			
a.	Should be automatically provide different luminance levels but shall also be controllable from the traffic center using software.			
b.	Should have auto dimming capability to adjust to ambient light level (sensor based automatic control)			
c.	Photoelectric sensor shall be positioned at the Display front and Display rear to measure ambient light. Capable of being continually exposed to direct sunlight without impairment of performance.			
7.	<b>Contrast Ratio</b>	R3 as per IRC/EN 12966 standard		
8.	<b>Beam Width</b>	B6+ as per IRC/EN12966 standards.		
9.	<b>Pixel Pitch</b>	12mm or better		
10.	<b>Picture Display</b>			
d.	At least 300mm as per IRC /EN 12966 standards			

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#	Parameter	Minimum Specifications	Bidder Compliance (Yes/No)	Product Documentation Reference
e.	Full Matrix: Number of lines & characters adjustable, active area: 2.88mX1.2m at least			
f.	Synchronized Dot to Dot display.			
a.	Capable of displaying real time message generated by CCCs/ICCC.			
b.	Special frontal design to avoid reflection.			
c.	Display shall be UV resistant			
<b>11.</b>	<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		
<b>12.</b>	<b>Viewing Distance</b>	Suitable for readability from 150 Mtrs. or more at the character size of 240mm, from moving vehicles.		
<b>13.</b>	<b>Self-Test</b>			
a.	VMD 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 Display board even when diodes are not illuminated.			
c.	All periodic self-test results shall be relayed to the CCCs/ICCC in real time to update the status of the VMD			
<b>14.</b>	<b>Alarms</b>			
a.	Door Open sensor to Inform Control room during unauthorized access			
b.	LED Pixel failure detection alarm			

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#	Parameter	Minimum Specifications	Bidder Compliance (Yes/No)	Product Documentation Reference
15.	<b>Flicker</b>	Refresh Frequency should not be less 90 Hz. No visible flicker to naked eye.		
16.	<b>Multiple Data Communication interface/Port</b>	RJ45 Ethernet, RS232, RS 485, FC port and any other suitable		
17.	<b>Communication (connectivity)</b>	Wired & GPRS based wireless technology with 3G upgradable to 4G capability.		
18.	<b>Ambient Operating Temperature</b>	The system should be capable of working in ambient temperature as per Allahabad weather conditions.		
19.	<b>Humidity (RH)</b>	Operating ambient humidity should be as per Allahabad weather conditions		
20.	<b>Protection against Pollution/dust/water</b>	Complete VMD should be of IP 65 protection level from front and IP54 from side and rear. As per EN60529 or equivalent Standard.		
21.	<b>Power</b>			
a.	Preferably 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.			

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#	Parameter	Minimum Specifications	Bidder Compliance (Yes/No)	Product Documentation Reference
22.	<b>Power Back-up &amp; its enclosure</b>	Should have UPS provisioning as per SLA requirements. The enclosure of UPS and battery should be pole mountable with IP 65 protected housing and lockable.		
23.	<b>Material for VMD frame</b>	Preferably at least 2mm aluminum or Non-corrosive, water resistant or better. Frame of the VMD should be black & Powder coated.		
24.	<b>Mounting, Installation and finishes</b>			
a.	Mounting structure shall use minimum 6Mtrs. High Cylindrical GI Pole (Class B) or suitable structure with 5.5 mtr. Minimum vertical clearance under the VMD from the Road surface.			
b.	The mounting shall be capable of withstanding road side vibrations at site of installation.			
c.	It shall be provided with suitable walkway for maintenance access.			
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.			
e.	Rugged locking mechanism should be provided for the onsite enclosures and cabinets.			
f.	For Structural safety, the successful bidder has to provide structural safety certificate from qualified structural engineers approved/ certified by Govt. Agency.			
25.	<b>Wind Load</b>	WL9 as per EN12966 to withstand high wind speeds and its own load.		

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#	Parameter	Minimum Specifications	Bidder Compliance (Yes/No)	Product Documentation Reference
<b>26.</b>	<b>Cabling, connections and Labelling.</b>			
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.			
b.	All connections shall be vibration-proof quick release connections except for power cables terminating in terminal blocks, which shall be screwed down.			
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.			
d.	All cables shall be clearly labelled with indelible indication that can clearly be identified by maintenance personnel using "As built : drawings".			
e.	Lightening arrester shall be installed for safety on each VMD.			
f.	The successful bidder has to provide safety certificate from qualified Electrical engineers approved/certified by Govt. Agency.			
<b>27.</b>	<b>Local Storage in VMD</b>	Embedded VMD controller should be capable to store at least 100 messages and symbols/pictograms to allow display to run in isolated mode on a predefined structures/timings, in case of connectivity failure.		

## **6.5. Solid Waste Management System**



The functional requirements and technical specifications provided in the below sections and at other sections in this RFP are indicative and carry guiding rule. The MSI is free to offer products and solutions which meet requirements of the RFP focusing on the outcome, future scalability, security, reliability and adherence to specified SLA under this RFP, in line with applicable standards & best practices adopted in the industry. The MSI is encouraged to design an Optimized solution which is technically superior, innovative, proven, better in terms of functionality and is cost effective. Any specified parameters mentioned in the scope/technical requirement in the RFP may be considered if it is required for meeting current & future requirements during the contract period. The MSI is fully responsible for the specified outcome to be achieved.

#### **6.5.1. Functional Requirements of the Solid Waste Management System**

##### **6.5.1.1. Door to Door Collection for Bulk Generators**

#	Minimum Specifications	Bidder Compliance (Yes/No)	Product Documentation Reference
1.	AMC vehicles & Bulk Generators should be installed with RFID Tags and RFID readers		
2.	Location of all the bulk generators are marked on the Map		
3.	Schedules & Routes are created as per current process for clearance of the waste		
4.	Data about Staff with Mobile number and location should be stored		
5.	RFID Tags Data Logging should be enabled manually or automatically at the time of clearance of the waste		
6.	System should ensure that complete coverage of door to door and community collections served by vehicles		
7.	Solution should keep certain Checks as per environmental regulations, like minimum frequency of lifting garbage etc.		
8.	System should enable capturing of: a. Area information (Zone / Ward / Colony / Society) b. Population details		

#	Minimum Specifications	Bidder Compliance (Yes/No)	Product Documentation Reference
	<p>c. Volume of the Solid waste which includes Wet &amp; Dry waste (Recycled &amp; Non Recycled)</p> <p>d. Resources required</p> <p>Collection procedure ( i.e. Primary : Bulk Generators &amp; Secondary : Collection Centers/Kudda Addas to SWM Plant)</p>		

#### **6.5.1.2. Vehicle Tracking and Monitoring System**

#	Minimum Specifications	Bidder Compliance (Yes/No)	Product Documentation Reference
1.	GPS tracking of the waste pick up vehicle for real time tracking		
2.	System should help in co-ordination between primary and secondary collection vehicles for transferring dump		
3.	Route Optimization shall help in reduction of trip time, fuel saving and serving more locations		
4.	Record history of vehicle routes, attended sites and other details		
5.	Monitoring & Reporting Application - reports of vehicles, garbage collection status etc.		
6.	Alert / Alarm management		
7.	Real time management of missed garbage transfer		
8.	Daily report of Door-Door Collection efficiency combined with complaints raised by Public		
9.	Monitoring & Reporting Application - reports of vehicles, garbage collection status etc.		
10.	Solution should be integrated into the GIS map		

#	Minimum Specifications	Bidder Compliance (Yes/No)	Product Documentation Reference
11.	<p>Garbage Collection Scheduling:</p> <p>a. Communication of route assignment to vehicles to pick-up the Garbage - Category wise like A: Highly in demand, B: Medium, C: Low Demand should be enabled to be passed on to the SWM department</p> <p>b. Assignment of dynamic routes' information to SWM using the vehicle initial route and waste collected should be enabled</p>		

**6.5.1.3. Aadhar Enabled Biometric Attendance System**

#	Minimum Specifications	Bidder Compliance (Yes/No)	Product Documentation Reference
1.	Should blend perfectly to match Aadhaar Certified Fingerprint and Iris scan		
2.	Gray scale finger image data may be stored, recorded, or transmitted in uncompressed – bit packed form.		
3.	The resolution of the image data formatted and recorded for interchange should be the scan resolution of the image.		
4.	Each record shall pertain to a single Aadhaar entry and shall contain an image record (consisting of single view) for each of one or more fingers/iris scans; multiple fingers/iris scans (single image records).		
5.	Live-scan plain Finger Impression type should be used		
6.	Except the scanner driver, there should not be any requirement for loading any software/ license while plugging the scanner.		

#	Minimum Specifications	Bidder Compliance (Yes/No)	Product Documentation Reference
7.	The scanner driver should be API enabled to ensure compatibility with any application		
8.	Should have inbuilt battery backup		
9.	Data retention should be provisioned in case of power failure		
10.	Should be able to mark time (hours) against the attendance of the worker		

#### **6.5.1.4. Unified Dashboard for Solid Waste Management System**

#	Minimum Specifications	Bidder Compliance (Yes/No)	Product Documentation Reference
1.	A unified View should show the primary and secondary collection. a. Included all vehicles tracked. b. Collection Percentage achieved daily – co-relating with the final dumping processes c. Co-relation with the complaints raised / Area, along with photographic evidence		
2.	System should be capable of providing missed collection		
3.	System should be capable of marking areas where waste is generated or high to low basis		
4.	System should be capable of showing only a single selected process for a particular area		
5.	System should be capable of showing complaints raised by citizen tagged to a particular location		
6.	System should be capable of showing CCTV footages from bulk waste generation points and inside the waste treatment plant		

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#	Minimum Specifications	Bidder Compliance (Yes/No)	Product Documentation Reference
7.	Unified view should be capable of being integrated with other departments		
8.	Unified View goal shall be to improve waste collection efficiency using the field infrastructure deployed		
9.	Any other reports aiding to perform the same shall be in scope of MSI.		
10.	Monitoring of the vehicle in real time to improve per vehicle productivity & reduce non-compliance.		
11.	Usage and route planning optimization of garbage trucks.		
12.	Rapid management of vehicle breakdown and maintenance.		
13.	Centralized command control center for waste collection and transportation.		
14.	Efficient monitoring and management of waste.		
15.	Automated monitoring of transfer stations, processing centers for daily garbage inward, outward using weigh bridge automation.		
16.	Live-Tracking of all Municipal vehicles under the project		
17.	Access to vehicle historical Data		
18.	Trip history tracing for every vehicle during any given period		
19.	Reports to understand the Distance travelled, Trips completed, On-road vehicles, Idle points, Garbage collection efficiency etc. to be made available on regular basis.		
20.	Data backup to be available on Cloud/any redundant infrastructure.		
21.	<b>Resource Utilization Dashboard</b>		
22.	A report indicating the deployment and utilization of the resources shall be provided.		

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#	Minimum Specifications	Bidder Compliance (Yes/No)	Product Documentation Reference
23.	The statement shall include proposed organizational structure, employee deployment, equipment procurement and utilization, contracting services, utilization of office and other facilities.		
24.	List of all the employees deployed for this Project with name and designation with identity proofs.		
25.	Attendance details of employees with their utilization on a daily basis as well as leaves availed		
26.	Details of employees deployed on each of the route and with each vehicle with their names, identity, driving licenses of driver's etc.		
27.	Proposed organizational structure of the Vendors to implement and manage the project.		

**6.5.1.5. Weighbridge Monitoring**

#	Minimum Specifications	Bidder Compliance (Yes/No)	Product Documentation Reference
1.	Camera based monitoring of entrance & exit		
2.	Camera based monitoring allow daily/weekly remote inspection from central office		
3.	Computerization of Weigh Bridges		
4.	Recording of the volume of garbage disposed on a daily basis		

**6.5.1.6. MIS Reports**

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#	Minimum Specifications	Bidder Compliance (Yes/No)	Product Documentation Reference
1.	Monitor the deployment of pickup trucks and personnel based on the schedule originally drawn		
2.	Info on the use of Transfer Stations		
3.	How much garbage received?		
4.	Door to door collection, ward wise		
5.	Reports from Dashboard view for all activities		
6.	Reports of Ward Wise Weight Report		
7.	Information/Contact details of ward-wise health officers		
8.	Energy production report		
9.	Any other custom report as per department		

**6.5.2. Technical Specifications of the Solid Waste Management System**

**6.5.3. RFID Reader**

#.	Parameter	Minimum Specifications	Bidder Compliance (Yes/No)	Product Documentation Reference
1.	<b>Make</b>		<to be provided by the bidder>	
2.	<b>Model</b>		<to be provided by the bidder>	
3.	Protocol	ISO18000-6B ISO18000-6C EPC GEN2		
4.	Frequency Range	Standard ISM 902 928MHz or ISM 865 868MHz		
5.	Operation Mode	FHSS		
6.	RF Power	0~30dBm, software adjustable		

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7.	Reading Speed	Software Programmable Average Reading per 64Bits <6ms		
8.	Reading Mode	Timing or Touch, Software Programmable		
9.	Communication Mode with central server	TCP/IP and GPRS		
10.	Data Input Port	Trigger input one time		
11.	Reading Range	Max 12 m		

**6.5.4. UHF Passive RFID Tag**

#.	Parameter	Minimum Specifications	Bidder Compliance (Yes/No)	Product Documentation Reference
1.	<b>Make</b>		<to be provided by the bidder>	
2.	<b>Model</b>		<to be provided by the bidder>	
3.	Type	ABS		
4.	Supported Transponders	ISO18000-6B ISO18000-6C EPC GEN2		
5.	Frequency Range	ISM 920~925MHz(china) ISM 902~928MHz (FCC), ISM865~868MHz		
6.	Operation Mode	Fixed Frequency or FHSS Software Programmable		
7.	Memory capacity	The tag should support ISO18000-6B protocol standard 2K Bits storage capacity, 1728 Bits (216bytes) writable user area; MR6730B metal supports EPC C1 GEN2 (ISO18000-6C), with 96Bits writable EPC Code area, 512Bits writable user area, and 32Bits password area.		
8.	Reading Rate	Software Programmable, Average Reading per 64Bits <10ms		
9.	Tags material	Metal material		
10.	Reading Range	>12 m related to reader and antenna(the farthest distance can reach to more than 15m)		



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#.	Parameter	Minimum Specifications	Bidder Compliance (Yes/No)	Product Documentation Reference
11.	Operation Temp	As per Allahabad weather conditions		

**6.5.5. Fixed Bullet IR Cameras for SWM Sites**

#	Parameters	Minimum Specifications	Bidder Compliance (Yes/No)	Product Documentation Reference
1.	<b>Make</b>	<to be provided by the bidder>		
2.	<b>Model</b>	<to be provided by the bidder>		
3.	Video Compression	H.264		
4.	Video Resolution	1920 X 1080		
5.	Frame rate	Min. 25 fps		
6.	Image Sensor	1/3" OR 1/4" Progressive Scan CCD / CMOS		
7.	Lens	Fixed 3.6mm or better		
8.	Minimum Illumination	Colour: 0.5 lux, B/W: 0 lux with IR On		
9.	IR Range	20 Mtrs or better		
10.	Day/Night Mode	Colour, Mono, Auto		
11.	S/N Ratio	≥ 50Db		
12.	Auto adjustment + Remote Control of Image settings	Colour, brightness, sharpness, contrast, white balance, exposure control, backlight compensation, Gain Control, Wide Dynamic Range		
13.	Protocol	HTTP, HTTPS, FTP, RTSP, RTP, TCP, UDP, RTCP, DHCP, UPnP, QoS, IPV4, IPV6, ONVIF Profile S		
14.	Security	Password Protection, IP Address filtering, User Access Log, HTTPS encryption		
15.	Operating conditions	As per Allahabad weather conditions		

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16.	Casing	NEMA 4X / IP-66 rated and IK10 rated		
17.	Certification	UL/EN,CE,FCC		
18.	Local storage	Minimum 64 GB Memory card in a Memory card slot. In the event of failure of connectivity to the central server the camera shall record video locally on the SD card automatically. After the connectivity is restored these recordings shall be automatically merged with the server recording such that no manual intervention is required to transfer the SD card based recordings to server.		
19.	Power Source	PoE, 12V		

**6.5.6. Aadhar Enabled Biometric Attendance System**

#	Parameters	Minimum Specifications	Bidder Compliance (Yes/No)	Product Documentation Reference
1.	<b>Make</b>	<to be provided by the bidder>		
2.	<b>Model</b>	<to be provided by the bidder>		
3.	Fingerprint template Compliance for minutiae data	ISO 19794(2) or UIDAI registered		
4.	Fingerprint template Compliance for image resolution	ISO 19794(2) or UIDAI registered		
5.	Image Acquisition Requirements	Setting level 31 or higher		
6.	Scan resolution pixels/centimeter (ppcm)	As per standards to meet the project requirements		
7.	Scan resolution pixels/inch (ppi)	As per standards to meet the project requirements		
8.	Pixel depth (bits)	As per standards to meet the project requirements		

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9.	Dynamic range (gray levels)	As per standards to meet the project requirements		
10.	RAM (MB)	512		
11.	Certification	EFTS/F		
12.	Enrolment and Verification (other than just the image of the finger being captured)	Live Swipe		
13.	Impression type	Live-scan plain / Live-Scan Contactless may be considered for verification.		
14.	Light source dependability	No		
15.	High Resistance	To shock, abrasion and water		
16.	Algorithm should include	Image Quality Determination and Feature Generalization		
17.	Encryption of fingerprint template	Using unique foreign key		
18.	Image acquisition and storage	According to RBI guidelines		
19.	USB connectivity	Yes		

## **6.6. Smart Parking System**

The functional requirements and technical specifications provided in the below sections and at other sections in this RFP are indicative and carry guiding rule. The MSI is free to offer products and solutions which meet requirements of the RFP focusing on the outcome, future scalability, security, reliability and adherence to specified SLA under this RFP, in line with applicable standards & best practices adopted in the industry. The MSI is encouraged to design an Optimized solution which is technically superior, innovative, proven, better in terms of functionality and is cost effective. Any specified parameters mentioned in the scope/technical requirement in the RFP may be considered if it is required for meeting current & future requirements during the contract period. The MSI is fully responsible for the specified outcome to be achieved.

### **6.6.1. Functional Requirements- Smart Parking System**

#### **6.6.1.1. Identifying vehicles at Entry/Exit**

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#	Minimum Specifications	Bidder Compliance (Yes/No)
1.	<b>Make</b>	<to be provided by the bidder>
2.	<b>Model</b>	<to be provided by the bidder>
3.	The smart parking system should be able to count the number of vehicles entering and exiting any parking structure	
4.	The smart parking system may use video camera based analytics or other sensor based solutions to determine number of vehicles entering and exiting parking lots. The smart parking system should do so at each floor, in case of multilevel parking and communicate the data	
5.	The smart parking system must geo-reference all the parking lots.	

**6.6.1.2. Visibility of vacant parking spaces and fare revision**

#	Minimum Specifications	Bidder Compliance (Yes/No)
1.	<b>Make</b>	<to be provided by the bidder>
2.	<b>Model</b>	<to be provided by the bidder>
3.	The total number of slots and free slots for parking must be displayed on a digital signboard near the entrance of the parking lots	
4.	The smart parking system should report occupancy of parking lots to a central software application deployed at the Integrated Command and Control Center.	
5.	The smart parking system should facilitate real time revision of parking fees and should enable real time communication of rules to handheld terminal, parking	
6.	The smart parking system should enable ASCL/AMC and Traffic Police to obtain real time situational awareness about the occupancy of parking lot through smart dashboard	

#	Minimum Specifications	Bidder Compliance (Yes/No)
7.	The smart parking system should enable citizens to obtain real time space availability and slot reservation capability via mobile app or web client.	

#### **6.6.1.3. Ticketing**

#	Minimum Specifications	Bidder Compliance (Yes/No)
1	<b>Make</b>	<to be provided by the bidder>
2	<b>Model</b>	<to be provided by the bidder>
3	The smart parking system should enable ASCL/AMC or any other appointed third party to facilitate generation of parking receipts and tickets based on occupancy of parking lots.	
4	The smart parking system needs to have parking ticket vending machine at the entrance where the ticket can be issued by the machine on pressing the button by the user/ operator. Further, the solution shall have provision for a handheld device through which parking receipts can be generated on payment of fees through card or cash	
5	The ticket, QR Code and Smart Parking Card or any other technology used by the MSI should be capable of capturing data that is easily retrievable at the exit.	
6	Should include the provisions for the following types of parking reservations:	
a	<b>Walk-In Parking:</b> This category of parking shall include the citizens who drive in to the parking without any prior booking. The citizens can be provided with a QR coded ticket or any other advanced technology as deemed fit by the Master System Integrator	
b	<b>Online Reservation of Parking spots:</b> The citizens should be able to reserve parking spots through online web application or the Citizen Mobile app. The pre-booking would be retained for a specific period of time and reassigned in case of no show. The motorists booking parking slots under this category can be identified with a QR code based or any other advanced technology as deemed fit by the Master System Integrator.	

#	Minimum Specifications	Bidder Compliance (Yes/No)
c	<b>Pass Based Parking:</b> There should be an option for users to buy monthly, quarterly or yearly passes for hassle free experience. The motorists opting for this category would be identified using RFID based, NFC based smart card or any other advanced technology as deemed fit by the Master System Integrator.	
d	<b>Premium Paid Parking:</b> There should be an option for users to choose premium parking spaces for e.g. near the entrance or exit. The corporate offices can also choose this option to reserve premium parking space for their employees. The motorists opting for this category would be identified using RFID based, NFC based smart card or any other advanced technology as deemed fit by the Master System Integrator.	
e	<b>Smart Card based Parking:</b> There should also be an option for users to be able to enter by flashing the smart card without any need to generate ticket.	

#### 6.6.1.4. Payment

#	Minimum Specifications	Bidder Compliance (Yes/No)
1.	<b>Make</b>	<to be provided by the bidder>
2.	<b>Model</b>	<to be provided by the bidder>
3.	The payment collection can be done via card as well as cash (manually) at the kiosk where parking ticket can be shown/ given to the staff at the exit. Parking staff should be able to scan the ticket and provide the printed receipt.	
4.	The system must be tamperproof.	
5.	Smart Cards shall be provided to regular users of the parking lots. The Smart Card must have the details of the user, the registered vehicle number (This may be a future requirement)	
6.	Along with paper ticket, the SI can propose a cost effective smart parking solution to include NFC enabled prepaid Smart Card System for premium customers and customers opting for monthly reserved parking passes.	
7.	The NFC enabled smart card reader would be available at pay station and would automatically deduct the requirement payment towards parking (This may be a future requirement)	

#### 6.6.1.5. Parking Management System

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#	Minimum Specifications	Bidder Compliance (Yes/No)
1.	<b>Make</b>	<to be provided by the bidder>
2.	<b>Model</b>	<to be provided by the bidder>
3.	The smart parking system should retain videos of car entering /exiting the parking zone as per the security parameters defined in the tender.	
4.	The MSI must ensure that all parking slots are individually and clearly marked. The smart parking system should enable accounting and mapping of individual parking spots. All newly proposed parking spots must have one-to-one mapping with parking sensors.	
5.	There should be a provision to increase or decrease the number of parking spaces that can be reserved online through web client or mobile App, and same must reflect on web clients or mobile apps	
6.	Parking Management System must geo-reference all the parking lots and shall have the ability to add more locations in future. Smart parking solution should enable accounting and mapping of individual parking spots to different operators/agencies and monitor the parking space utilization and revenue from those facilities	
7.	Each off-street parking lot can have a local server for storage and hosting the local parking management application while on-street parking lot payment system can connect via City Wi-Fi or other Communication network to central server for exchange of data/information.	

**6.6.1.6. Accessibility of real time Parking space availability over Web client and Mobile App**

#	Minimum Specifications	Bidder Compliance (Yes/No)
1.	<b>Make</b>	<to be provided by the bidder>
2.	<b>Model</b>	<to be provided by the bidder>
3.	The smart parking system should provide real time location based view to citizens about proximity of parking lots and availability of parking lots.	
4.	The smart parking system should have a mobile and a web delivery channel for citizens to get real time parking availability and pre book parking lots using online payment of parking charges facilitated through a payment gateway	
5.	A mobile application and web based user interface should be provided with the following features:	

#	Minimum Specifications	Bidder Compliance (Yes/No)
	<ul style="list-style-type: none"> <li>a) The application should have citizen module and officer module.</li> <li>b) The citizen should be able to see all the parking lots with exact available space in a real time mode.</li> <li>c) While locating nearest parking lot, the most updated parking slot availability should be given to the user.</li> <li>d) Through the citizen module, the user should be able to locate nearest parking lot and also pre-book based on his geographical coordinates. The same information must be made available on map with routing information.</li> <li>e) Citizens should be given an option to extend the pre-booked parking space</li> <li>f) Reservation should be permitted for specially-abled citizens too.</li> <li>g) A convenience fee shall be charged for all online booking, and there shall be some penalty levied in case of cancellation after the specified time period.</li> <li>h) The application should have a compliance officer module where ASCL/AMC designated inspector / operator shall be able to check compliance of slot occupancy against the fees paid by the citizen.</li> <li>i) The citizens should be able to generate MIS report to view their occupancy of parking lots over a defined time period.</li> <li>j) The administrators should be able to generate MIS report to view occupancy, collection and other usage statistics over a defined time period.</li> </ul>	

#### **6.6.1.7. Accounting**

#	Minimum Specifications	Bidder Compliance (Yes/No)
1.	<b>Make</b>	<to be provided by the bidder>
2.	<b>Model</b>	<to be provided by the bidder>
3.	Should provide an application with analytics capability for providing details such as Usage and Vacancy periods, premium parking demand etc.	
4.	The solution should be automated, reliable, cost effective, secure, scalable, environment friendly, energy efficient, and must entail minimum human intervention for day-to-day parking management.	
5.	System should be able to integrate with ITMS/ANPR application, in order to identify restricted or not listed vehicles etc.	



#	Minimum Specifications	Bidder Compliance (Yes/No)
6.	The smart parking solution should enable the above functions with minimum manual intervention	

## **6.6.2. Technical Specifications - Smart Parking System**

### **6.6.2.1. Automatic Ticketing Dispenser**

#	Minimum Specifications	Bidder Compliance (Yes/No)	Product Documentation Reference
1.	<b>Make</b>	<to be provided by the bidder>	
2.	<b>Model</b>	<to be provided by the bidder>	
3.	Ticket dispenser with magnetic recording and printing of date, time and other data of car entrance to parking, side and central strip versions		
4.	Magnetic reader of season cards on the same reader mouth as ticket issuer device. Smart card reader (option)		
5.	Credit card access control system available as an option Proximity card (contactless smart-card) reader for season cards control (optional)		
6.	Automatic/ manual ticket issue activated by vehicle presence detector		
7.	Checking/ validation of season cards, full/ partial time, residents, restricted areas cards as well as master cards, monetary value, time limit and other system card as. Anti-pass back controls on cards		
8.	Control of vehicle passage sequence, sending ticket code as "cancelled" to the Central Unit in case of abnormal operation		
9.	Barrier alarm control and management and controls manual barrier opening		

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#	Minimum Specifications	Bidder Compliance (Yes/No)	Product Documentation Reference
10.	Electronic self-adjusting vehicle presence detector that prevents ticket extraction by pedestrians		
11.	User-oriented alphanumerical information display in two languages with TFT monitor in option		
12.	Date and time visualization on display while inactive		
13.	Ticket loading container with capacity for 5000 tickets with Ticket level control		
14.	Motorized magnetic ISO strip reader/recorder		
15.	Ethernet communications connection to the central unit with Optional RS-422 connection		
16.	Pocket terminal connection for maintenance processes Autonomous operation		
17.	Electronically controlled internal heating/ ventilation system		
18.	Polyester powder painted and oven-dried steel housing		
19.	Operating temperature: As per Allahabad weather conditions Protected environment use (roofed) Power supply: 220 Vac. $\pm$ 10% 50 Hz (110 Vac. $\pm$ 10% 60 Hz. optional) Maximum consumption 70 w (270w with heater option) Conform ISO 9001 Quality Assurance Standard CE, IC, CNRTLUS certified		

**6.6.2.2. Parking Sensors**

#	Minimum Specifications	Bidder Compliance (Yes/No)	Product Documentation Reference
1.	<b>Make</b>	<to be provided by the bidder>	
2.	<b>Model</b>	<to be provided by the bidder>	
3.	Sensors should be used for detecting the real-time status of the parking space		
4.	It should be able to upgrade its firmware/functionality remotely from the Central Control Center Or Integrated Command control center		

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#	Minimum Specifications	Bidder Compliance (Yes/No)	Product Documentation Reference
5.	It should be able to permit an optimal angle between the sensor output and target		
6.	Sensor should be able to work in all weather conditions relevant to the project site		
7.	Sensors should preferably have magnetic or optic technology		
8.	Conform ISO 9001 Quality Assurance Standard Protection Level: IP67		

**6.6.2.3. Ticket Validator**

#	Minimum Specifications	Bidder Compliance (Yes/No)	Product Documentation Reference
1.	<b>Make</b>	<to be provided by the bidder>	
2.	<b>Model</b>	<to be provided by the bidder>	
3.	Motorized magnetic strip reader/recorder ISO standard, side and central strip versions		
4.	Control/ validation of exit tickets and different types of season cards		
5.	Allow up to 4 periods of grace to be chosen for different exits		
6.	Inner container to collect exit tickets		
7.	Control/ validation of season cards, full/partial time, residents, restricted areas cards, QR code or BAR code recognition from mobile devices as well as monetary value, time limit and others system cards		
8.	Anti-pass back control on cards		
9.	Control of vehicle passage sequence, sending to the Central Unit the ticket/ card code as to include it in the black list		
10.	Barrier alarm control and management. Controls manual barrier opening 1. Self-adjusting electronic vehicle presence detector. Impedes ticket or card validation by pedestrians 2. User-oriented alphanumerical information display in two languages. TFT monitor in option		

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#	Minimum Specifications	Bidder Compliance (Yes/No)	Product Documentation Reference
	3. Date and time visualization on display while inactive 4. Ethernet communications connection to the central unit. Optional RS-422 connection 5. Pocket terminal connection for maintenance processes 6. Autonomous operation 7. Electronically controlled internal heating/ ventilation system 8. Polyester powder painted and oven-dried steel housing 9. Operating temperature: As per Allahabad weather conditions 10. Protected environment use (roofed) 11. Power supply: 220 Vac. $\pm$ 10% 50 Hz (110 Vac. $\pm$ 10% 60 Hz. optional) Maximum consumption 70 w (270w with heater option)		

**6.6.2.4. Parking Management and Guidance System**

#	Minimum Specifications	Bidder Compliance (Yes/No)	Product Documentation Reference
1.	<b>Make</b>	<to be provided by the bidder>	
2.	<b>Model</b>	<to be provided by the bidder>	
3.	The solution shall be implemented in the Integrated Industry Standard Open Platform to manage, monitor and control Smart Parking initiative. Integrated Industry Standard Open Platform should have API based access to the Parking Management and Guidance System as well as the devices utilized for parking.		
4.	The solution should be able to monitor and configure all devices with respect to parking (sensors, displays, and signal converters).		
5.	It should control the system functionality and monitoring should be done from other computers and remotely.		
6.	It should provide capability to create full report of exact location with respect to floors, areas, levels, etc. It should be customizable and update about		

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#	Minimum Specifications	Bidder Compliance (Yes/No)	Product Documentation Reference
	occupation and movements of vehicles in real time.		
7.	It should provide real time monitoring of all system status.		
8.	It should report alarms when devices are not connected or when any equipment failure occurs.		
9.	The software should notify alarms after a period of time if a car is abandoned.		
10.	The software should provide full graphical plan information of the car park with exact locations.		
11.	The software should allow downloading the information and configuration of fields for maintenance purpose		
12.	The software application should have built in tools for third party integration to obtain real time information		
13.	Should provide access at user levels with passwords		
14.	The software should have historic log for available spaces, period of time.		
15.	The software should be able to handle manual overriding of available spaces, special parking requirements for reserved spaces and handicapped lots		

**6.6.2.5. Payment Kiosk**

#	Minimum Specifications	Bidder Compliance (Yes/No)	Product Documentation Reference
1.	<b>Make</b>	<to be provided by the bidder>	
2.	<b>Model</b>	<to be provided by the bidder>	
3.	Accept different types of coins and returns changes		
4.	Programmable automatic recharge of out-of-stock coins by means of a safe container with an approximate 500 coins capacity		
5.	Banknote acceptor for different notes types in any of the 4 insertion directions with two deposits for recycling, storage and change returns (optional) and a capacity of 120 banknotes for cassette		
6.	Safety banknote collection box (optional)		

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#	Minimum Specifications	Bidder Compliance (Yes/No)	Product Documentation Reference
7.	Thermal printer (no printer ribbon required) for receipts, payment vouchers, liquidation and accounts states		
8.	Automatically issues liquidation voucher on withdrawal of safety boxes (coins or notes). The voucher specifies the content of box number of coins/ notes of each type and total		
9.	Accepts payment with discount, money and time vouchers		
10.	Accepts credit card payment		
11.	Payment allowed for expended extra time by part-time season holders		
12.	Multilingual information display with 12" TFT monitor		
13.	Motorized magnetic ISO lateral strip reader/ recorder		
14.	Optional magnetic card reader/collector		
15.	Ethernet communications connection to the central unit. Optional RS-422 connection		
16.	Pocket terminal connection for maintenance processes		
17.	Powerless Operation: Incorporating a UPS to enable the credit pay station to complete operations in progress in the event of a power supply failure		
18.	Polyester powder painted and oven-dried steel housing		
19.	Operating temperature: As per Allahabad weather conditions		
20.	Protected environment use (roofed)		
21.	Power supply: 220 Vac. $\pm$ 10% 50 Hz (110 Vac. $\pm$ 10% 60 Hz. option)		

**6.6.2.6. Variable Messaging Display Board for Parking Site**

#	Minimum Specifications	Bidder Compliance (Yes/No)	Product Documentation Reference
1.	<b>Make</b>	<to be provided by the bidder>	
2.	<b>Model</b>	<to be provided by the bidder>	
3.	Source of light: High intensity LEDs		
4.	Luminance Class: L-3 as per EN 12966		
5.	Contrast Ratio: R2-R3 as per EN 12966		

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#	Minimum Specifications	Bidder Compliance (Yes/No)	Product Documentation Reference
	Beam Ratio: B-3 as per should be wide angle B6 or B7 or B4 Viewing distance: >200 meters		
6.	Display capability: Alpha-numeric, Pictorials, Graphical & Video		
7.	Display Front Panel: 100% anti-glare		
8.	Language: Multilingual (Hindi /English) and all fonts supported by windows.		
9.	Auto Dimming: Auto dimming adjust to ambient light level.		
10.	In built sensor: Photoelectric sensor		
11.	Display area: Display size of VMD should be Length: 3000 +/- 200 mm Height: 2000 +/- 200 mm		
12.	Number of Lines & Characters: The number of lines and characters can be customized as per the requirements (Min. 3 lines & 10 characters)		
13.	Brightness & control: Controlled through software		
14.	Display Driving method: Direct current control driving circuit. Driver card of display applies Direct Current Technology.		
15.	Display Style: Stay on and flashing		
16.	Connectivity: IP based		
17.	Access control: Access control mechanism would be also required to establish so that the usage is regulated.		
18.	Integration: With smart city operations center and service providers for offering G2C and B2c services.		
19.	Construction: Cast Iron Foundation and M.S. Pole, Sturdy Body for equipment.		
20.	230VAC+ 15%, 50Hz, Single Phase (automatically restart in the event of an electricity supply failure) Batteries with solar charging options can also be recommended as back up		
21.	Power: Automatic on/off operation		
22.	Casing: IP-55 rated for housing		
23.	Operating conditions: As per Allahabad City conditions		

#### **6.6.2.7. Emergency Call Box**

#	Minimum Specifications	Bidder Compliance (Yes/No)	Product Documentation Reference
1.	<b>Make</b>	<to be provided by the bidder>	
2.	<b>Model</b>	<to be provided by the bidder>	
3.	IP rating: IP66		
4.	Front panel: Stainless steel cover		
5.	Internal speaker amplifier: 10W class D		
6.	Microphone technology: Digital (MEMS)		
7.	Echo cancellation		
8.	Noise cancelling (static)		
9.	Web browser configuration		
10.	Software configuration		
11.	General Purpose I/O: 6 (configurable)		
12.	Power Option: PoE or external supply		
13.	Operating temperature: As per Allahabad city conditions		
14.	Relative humidity: As per Allahabad weather conditions		

#### **6.6.2.8. Wireless Gateway**

#	Minimum Specifications	Bidder Compliance (Yes/No)	Product Documentation Reference
1.	<b>Make</b>	<to be provided by the bidder>	
2.	<b>Model</b>	<to be provided by the bidder>	
3.	Wireless Gateway shall communicate with northbound network through dedicated leased lines connecting central control center or through pre-terminated MPLS circuits over fiber network		
4.	Wireless Gateway shall communicate wirelessly at 2.4Ghz/5 Ghz ISM band with 128 bit AES encryption with southbound devices like wireless Repeaters and parking sensors		
5.	Every Repeater shall have battery backup for 6 hours of operation and powered through AC mains		
6.	Wireless Gateway shall have IP67 protection		
7.	Wireless Gateway shall connect up to minimum 10 repeaters within its radio range		

#### **6.6.2.9. CCTV Cameras for Smart Parking**



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#	Parameters	Minimum Specifications	Bidder Compliance (Yes/No)	Product Documentation Reference
1.	<b>Make</b>	<to be provided by the bidder>		
2.	<b>Model</b>	<to be provided by the bidder>		
3.	Video Compression	H.264		
4.	Video Resolution	1920 X 1080		
5.	Frame rate	Min. 25 fps		
6.	Image Sensor	1/3" OR 1/4" Progressive Scan CCD / CMOS		
7.	Lens	Fixed 3.6mm or better		
8.	Minimum Illumination	Colour: 0.5 lux, B/W: 0 lux with IR On		
9.	IR Range	20 Mtrs or better		
10.	Day/Night Mode	Colour, Mono, Auto		
11.	S/N Ratio	≥ 50Db		
12.	Auto adjustment + Remote Control of Image settings	Colour, brightness, sharpness, contrast, white balance, exposure control, backlight compensation, Gain Control, Wide Dynamic Range		
13.	Protocol	HTTP, HTTPS, FTP, RTSP, RTP, TCP, UDP, RTCP, DHCP, UPnP, QoS, IPV4, IPV6, ONVIF Profile S		
14.	Security	Password Protection, IP Address filtering, User Access Log, HTTPS encryption		
15.	Operating conditions	As per Allahabad city conditions		

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16.	Casing	NEMA 4X / IP-66 rated and IK10 rated		
17.	Certification	UL/EN,CE,FCC		
18.	Local storage	Minimum 64 GB Memory card in a Memory card slot. In the event of failure of connectivity to the central server the camera shall record video locally on the SD card automatically. After the connectivity is restored these recordings shall be automatically merged with the server recording such that no manual intervention is required to transfer the SD card based recordings to server.		
19.	Power Source	PoE, 12V		

**6.6.2.10. Smart Card Reader**

#	Minimum Specifications	Bidder Compliance (Yes/No)	Product Documentation Reference
1.	<b>Make</b>	<to be provided by the bidder>	
2.	<b>Model</b>	<to be provided by the bidder>	
3.	Display: 7" inches or higher scratch resistant multi point capacitive touch screen with minimum WSVGA resolution (1024 X 600). 3.5" QVGA with backlight, TFT-LCD, 260K, 240 x 320		
4.	CPU/Processor: As per solution design without effecting the performance of application		
5.	RAM: As per solution design without effecting the performance of application		
6.	Memory: As per solution design without effecting the performance of application		

**Request for Proposal (RFP) for Selection of Master System Integrator (MSI) for Implementation of Integrated Command & Control Center (ICCC) in Allahabad City**

#	Minimum Specifications	Bidder Compliance (Yes/No)	Product Documentation Reference
7.	Expansion slot: At least a micro SD slot supporting up to 16 GB memory card		
8.	Audio: Good quality Speaker with 1W or higher output for announcements. Speaker, Headset jack		
9.	External Keyboard support: Device should support keyboard through USB or Bluetooth interface		
10.	Connectivity: Device should support 3G/4G, Wi-Fi connectivity and GPS feature		
11.	USB Port: At least one free USB port shall be available after setting up the entire solution including peripheral devices		
12.	Battery shall provide 24x7 operations		
13.	Operating system: Should support latest versions of iOS, Android and windows		
14.	Certification: RoHS (Restriction of Hazardous substance)CE or UL		
15.	Indicators: Status indicator provides ease of use, Indicators for connectivity (presence/absence), signal strength, battery status etc.,		
16.	Camera: 2 megapixel camera w/ LED Flash.		
17.	Barcode Reader: Barcode reader capable of reading 1D Laser Class II or 1D&2D CMOS Imager		
18.	SIM/ SAM Slots: Minimum 1 SIM and 2 SAM Slots (Security encryption of MI Card) to support secure loading of signed applications		
19.	Biometric Sensor: STQC certified Finger Print Module IRIS Scanner (Optional): STQC certified IRIS scanner Module		
20.	Smart Card Reader: ISO 7816 Compliant		
21.	Printer: Integrated or external. 2" thermal Printer (max. 90mm/sec)		
22.	Antenna (mandatory): Internal		
23.	Terminal Management: Device should be remotely manageable in secured mode		
24.	Certification: PCI / EMV Certification (Bank Certified) RFID Reader: Optional, ISO 14443 A/B (MIFARE, Calypso), ISO 15693; ISO 14443		

**Request for Proposal (RFP) for Selection of Master System Integrator (MSI) for Implementation of Integrated Command & Control Center (ICCC) in Allahabad City**

#	Minimum Specifications	Bidder Compliance (Yes/No)	Product Documentation Reference
	A/B (MIFARE, Calypso), ISO 18092 (NFC), Felica Radio		
25.	WWAN Radio- Optional, CDMA 1x for Korea SKT, LGT; GSM/GPRS/eGPRS for global		
26.	WLAN Radio- IEEE 802.11b/g		
27.	WPAN Radio- Bluetooth V2.0+EDR Class II		
28.	Capabilities for Transaction and Payment		
29.	MSR- Bi-directional, Track1,2,3, ISO 7810, ISO 7811, ISO 7813		
30.	Contact Payment- EMV Level 1&2, ISO 7816		
31.	Contactless Payment- Optional, EMV Contactless Level 1 & 2 (Master PayPass, Visa Wave)		
32.	PIN Transaction- Optional, PCI PED 2.0; APACS Common Criteria; GIE CB Approved		
33.	GPS: Optional, Integrated GPS w/ AGPS and DGPS Environment & Durability		
34.	Operating Temperature: As per Allahabad city conditions		
35.	Humidity- As per Allahabad weather conditions		
36.	Drop/Free Fall Specification- Minimum 4ft. / 1.2m drop to steel surface with silicon case		
37.	Vibration Test should be in packed condition, switched off conditions (10-150Hz, 0.15mm/2g, 10 sweep, cycles/axes)		
38.	Bump test should be in packed condition, switched off condition.(1000Bumps, 40g, in vertical position)		

**6.6.2.11. Technical Specification of Controller**

High Performance TCP/IP intelligent vehicle counting system Controller with display to indicate available parking slots & other accessories, Capable of connecting with multiple displays, loop sensors, Enclosed in Tamper proof enclosure, specifically to be used with Entry and Exit Barrier to provide automated update about the availability/occupancy of parking slots

**6.7. Transit Management System for City Buses**

The functional requirements and technical specifications provided in the below sections and at other sections in this RFP are indicative and carry guiding rule. The MSI is free to offer products and

solutions which meet requirements of the RFP focusing on the outcome, future scalability, security, reliability and adherence to specified SLA under this RFP, in line with applicable standards & best practices adopted in the industry. The MSI is encouraged to design an Optimized solution which is technically superior, innovative, proven, better in terms of functionality and is cost effective. Any specified parameters mentioned in the scope/technical requirement in the RFP may be considered if it is required for meeting current & future requirements during the contract period. The MSI is fully responsible for the specified outcome to be achieved.

#### **6.7.1. Functional Requirement**

##### **6.7.1.1. Automated Vehicle Location System**

The Automated Vehicle Location System (AVLS) shall primarily use GPS based location tracking devices mounted on the vehicle as primary source of data for tracking purposes. The location and associated data acquired from the vehicle units shall act as input source for tracking and operations process management required by user executing their specific functions. The AVLS system shall enable ASCL/ACTSL operations team to monitor vehicle movement in real-time and synthesize the AVL field data to deliver the same on the public information system devices installed on Bus stations, Terminals, Buses, ASCL/ACTSL customer portal, mobile information delivery system in case of public transit application. The AVL data from vehicles other than the transit vehicles shall be delivered to individual process owners within ASCL/ACTSL for further use and processing based on the requirements identified for individual departments.

The AVLS shall be source for enabling public information system service which acts as a source of information to be made available across various types of end point devices like mobile, fixed displays, web etc. in form of text & voice.

The AVLS for city bus shall essentially comprise of following components:

- Bus Mounted GPS based controller with two way communication interface.
- On-board Passenger Information System
- Off-board Passenger Information System
- GIS Based Fleet Monitoring and Control System

The central AVLS system should offer functionality to manage diversity of end use requirement as may be required by individual departments for operational use purposes. This should be facilitated by use of common GIS platform and allowing customization of views with respect to asset identification, tracking and process management.

The AVLS system shall essentially offer workflows, rules and SOP's being mapped based on the process type and user authorization to carry out functional processes as may be required for specific operations. It may be noted that each department may have specific routing and tracking requirements which may be very specific in case of emergency vehicles and other type of services. The system should offer dispatch and scheduling capability to manage vehicles with reference to end use requirement.

The MSI shall be required to provide facility to ensure that end use requirement of different departments and vehicles is met and functional and technical processes are provided to meet the operational requirements.

The system shall also be compliant to GTFS / inter-operable data formats to enable external technology ecosystem provider to build complimentary applications to further boost consumer oriented delivery and service environment.

#### **6.7.1.2. Automated Fare Collection System**

1. Implement integrated fare management process for transit services within Allahabad city
2. Use Open loop based electronic payments platform
3. Integrate with Banking infrastructure for best industry technology, practices and services
4. Stimulate growth in electronic payments and their by also augment increased ridership on transport system.
5. Simplify fare policy and ability for smart and integrated pricing
6. Decrease dwell time on transit systems
7. Increase ease of use for customers to promote customer self-service
  - a. A goal for the new payment system is to improve the payments experience by reducing complexity and giving the user's easier ways to pay that are familiar.
  - b. The easy acceptance of electronic payments and consequent improvement in payments processes is expected to improve the citizens experience drastically.
8. Foster regional transit fare integration
  - a. It is important for the ASCL/ACTSL to implement a solution that meets current needs, and provides a transition path to meet the future needs of the region. The ASCL/ACTSL wishes to avoid technologies that are closed, out of date and not scalable.
9. Decrease customer calls to the ASCL/ACTSL's customer information center to decrease customer service costs
10. Reduce current manual fare media and reduce maintenance costs
11. Reduce cash and lower cash handling costs
12. Integrate with other on-board equipment for single sign on for bus operators.
13. Consider integration with regional partners' future ticketing solutions
14. Unify the payments experience by integrating mobile payments and ticketing with other applications.
15. Provide seamless operation with the AFCS facilities.
16. Monitor and manage service adherence and performance
17. Integrate, automate and secure ticketing and payments.

#### **6.7.1.3. Passenger Information System (PIS)**

The passenger information system is a very important exponent of Transit Management System and renders a very important consumer facing service. Accurate and timely transit information delivery

enables consumer trust on public transport service and also aids modal shift in long term, as the reliability and availability becomes evident to the users.

The passenger information system is an integrated service which utilizes tracking data from vehicles which is centrally processed for the purpose of arrival and departure time estimation. Central PIS system shall deliver ETA/ETD information on schedule or request basis depending on the type of end point application or device. The central PIS delivers ETA / ETD to fixed display devices installed on bus stations at a set frequency or on bus movement basis. The PIS information on buses is driven by local geo location aided controller which has capability to deliver information in visual and audio formats, this controller can also be interrupted by ICCC to display or play specific messages dynamically. The transit information to commuters shall also be delivered via other electronic means like website, mobile app, SMS or IVRS. This multi-channel commuter interface enables quick access to transport system and ensure citizens see the city transit system as safe and reliable alternative for their travel purposes.

The system shall consist of following units to offer users access to real-time information regarding operations of bus transit service and extend ease of information access related to travel needs:

- a. Display Screen on Bus Terminals
- b. Display Screen on Bus Shelters
- c. Display Screen/Voice announcement system on Bus
- d. ASCL/ACTSL web portal for Bus Schedule &ETA, SMS, Mobile App and IVRS.

The PIS display systems at bus stations shall display real-time information of the route and estimated time of arrival using communication system installed within the station (Wired / Wireless) with the central AVLS / PIS Application. The system shall have capabilities to clearly indicate the direction and route no of the bus on the display to assist passengers.

The bus display units on the front wind shield and the back window shall display bus route information and the internal display shall display real-time information of the stations bus in terms of route information, next stop etc. via text and voice interface. The voice information system shall also derive information of the next station based on the location information derived from the GPS unit and shall have capabilities of playing pre-recorded voice information in the bus. This system shall also be used to deliver consumer centric outreach information as may be required by the transit agency from time-to-time.

The ASCL/ACTSL web portal shall enable passengers to get information about the bus schedules on various routes operated by ASCL/ACTSL and shall also have facility to deliver ETA based on the real-time data from central PIS system. PIS shall also be made available to users via mobile apps, SMS and IVRS.

#### **6.7.1.4. Vehicle Scheduling & Dispatch System**

Scheduling/dispatch software shall be used to aid designing and modifying transit routes. It shall also be used to route, schedule, and dispatch vehicles in demand response operations. The application shall combine GIS and AVL to coordinate different transit functions.

Combined technologies such as, computer-aided dispatching and AVL shall increase the efficiency of transit operations, enhance safety, improve service. For example, systems integrating automated

scheduling and dispatching and AVL enable a dispatcher to know the exact location and status of each bus under control. This real-time information allows the dispatcher to address any problems with service or to respond to any emergency. In addition, automated dispatching software and AVL allows the coordination of services among many separate transportation agencies.

Vehicle scheduling and dispatching system should be capable of dynamic planning and Capable of optimizing 1000s of vehicle movements, the system should be capable of automatic dispatch distribution and transport operations, dynamically rescheduling vehicle and driver assignments based on real-time events.

Vehicle scheduling and dispatch system shall be capable of providing schedule adherence reporting, route condition monitoring, emergency / incident interfaces and dynamic scheduling apart for standard functions that would be required to deliver computer aided scheduling and dispatch services from designated operations locations within ASCL/ACTSL operations framework.

This system is expected to lend its functionality not only to transit vehicles but also to other municipal vehicles functioning under engineering and emergency services.

#### **6.7.1.5. Depot Management System**

##### **Integrated Depot Management System**

This module enables to automate depot Operations, which include workshop management, fuel management, traffic management, vehicle management, and so on. The module shall also cover administrative activities and stores requirement.

##### **Stores & Inventory System**

This module shall enable automation of stores and inventory for various items at each depot, workshop, and division and so on. The module also covers purchase and procurement processes right from sampling to evaluation of products to tendering to purchases to consumption. It also enables to exchange the information across the depots, divisions and workshops for products availability and requisitions.

##### **Personal Information System**

This module covers the various processes related to Payroll and HR activities of Personnel working at Central Units, Divisions, Depots and Workshops. It offers centralized system for better control as well as employee satisfaction.

##### **Functional units of IT system and interrelation**

The IT system for ASCL/ACTSL operations shall be designed to meet specific needs of following operational entities to achieve the above system needs:

- Central Control Center
  - i) Central Computing Infrastructure
  - ii) Central Vehicle Monitoring System
- Bus Terminals



- Bus Shelters
- City Bus
- Bus Depots

## **6.7.2. Technical Specifications**

### **6.7.2.1. GPS based Automated Vehicle Location System**

#### **6.7.2.1.1. Bus Vehicle tracking device**

The Bus Driver Console shall be installed on the ACTSL buses. The MSI is required to interface with the on-board computer to take necessary data required for control & operations purposes.

The Driver Console Unit with wireless communication module (based on GPRS/3G/Wi-Fi) shall be used to provide vehicle tracking accurately and reliably. The back end system shall be able to produce MIS reports of the vehicle schedule adherence report and operated kilometers by each bus, by route and by fleet of each Service provider. ASCL/ACTSL may require additional information to be extracted from the vehicle tracking information logged at the control center.

The unit would additionally have an interface module in front of the bus driver for two way communication, messages to be sent by driver and messages to be sent to the driver from the control center.

The Bus Driver Console unit has to be mounted on board the bus and the assembly has to be designed in a way that integrates with the dashboard of the bus. The bidder has to provide a design which should be theft proof and cannot be in normal circumstances removed from the bus unless standard technique specified by the bidder is applied.

The bus driver console shall act as the sole management console for devices onboard like PIS and AFCS equipment's. The BDC shall operate PIS manually in-case of GPS outage.

The Unit should primarily be able to help central monitoring system to generate minimum of following data points as minimum and at the time of finalization of requirements a comprehensive requirement shall be furnished to the service provider:

- Start Stop
- Begin – End Shift
- Fleet Summary
- Detailed Activity
- Speed
- Fleet Status
- Alerts
- Battery Report
- Unit ON/OFF Report
- Ignition ON/OFF

ASCL/ACTSL can request for other reports / data / information as deemed necessary for management purposes.

The unit shall also be able to deliver real-time information to drivers with respect to route information, messages from control center and any other intervention that may be required to ensure operational sanctity. The units supplied should have facility to for drivers to login/log-off facility and data should be linked with the AVLS server for authentication and tracking purposes.

#### **6.7.2.1.2. AVLS Software**

The software shall be web based and utilizes high resolution digital map to show real-time position of the vehicles. The software shall provide map based tracking and transit route line based tracking of vehicles by the control center operators. The software is expected to have enterprise capabilities which enables multiple user type to be enabled to carry out various functions like, Alarm Management, Vehicle Schedule Tracking, Speed Management, Stoppage management, Route replays, bus tracking dashboard etc. as a standard functionality. The software shall enable control center management staff quick decision making capability, which shall be achieved by providing graphical tools for visualization. The software shall enable ASCL/ACTSL to drill and analyze information and online data in a multi-dimensional manner. Comprehensive analysis and reporting capabilities are expected to be part of the application delivery which matches the world standard capabilities of AVLS systems.

The software should have capability to have a multi-screen based tracking system, so as to enable tracking staff to quickly analyze activities and have a better insight into operational data of all activities within the system.

#### **6.7.2.1.3. AVLS Controller Software Functionalities**

1. Ability to distribute control of services among controllers
2. Real Time Communication with the Fleet
3. Supervision and Monitoring Of Fleet Positions in Real-Time
4. Ability to Track Bus Service based on different operational state parameters
5. Time Monitoring Analysis
6. On-Line Assignment of Service Time
7. Management of Information Displays at Stops
8. Regulating Service by Time and Frequency
9. Ability to See Trips by different colours
10. Colour Legend of Vehicles
11. Status Tracking of Messages Sent to BDC
12. Status Tracking of Messages Sent to Internal Screens
13. Controller System Messages
14. Controller's Authentication
15. Vehicles, Virtual Vehicles, Stops and Lines on Map
16. Vehicles, Virtual Vehicles, Stops and Lines on Straight-Line Diagram
17. Information on Vehicle on mouse overs
18. Information on PIS and Stops on Mouse Over

19. Vehicle Menu
20. Information on Drivers
21. Detailed Control information of Vehicle
22. Selection of Stop on Route
23. Ability to Define Types of Stops
24. Detailed Stop Control
25. Detailed Stop Control
26. Current Trip Views on Map, Lines etc.
27. Multi-Map Views
28. Ability for Zone Creation
29. Ability to Draw Detours on Map in Send it to Vehicles in Real-Time
30. Management of Detours
31. General Control of Lines
32. Control of Routes
33. Technical Alarms Management and Disposal
34. Bus Alerts management and Disposal
35. Messages to Console, Manually, Auto Mode, Event Activated
36. Automatic Messages with Acknowledgment
37. Messages to PIS Screens
38. Answering Messages from the Vehicle
39. Panic Button Messages Management
40. Information Panel Messages
41. Line Legend
42. Lines with Activated Legend
43. Bus Service Graph
44. Trip Graph
45. Information Signs – Checking On the Lines
46. Information Signs – Checking On Predefined Messages
47. Information Signs – Checking On On-Line Messages
48. Information Displays – Lines
49. Information Displays – Predefined Messages
50. Information Signs – On-Line Messages
51. Information Signs – Simulator
52. Statistics of Lines, Drivers, Routes etc.
53. Traffic Density using Colour Codes on Lines, Maps

#### **6.7.2.1.4. GPS Device Configuration & Management**

1. Configuration of driver's interface (console) messages
2. Configuration of predefined messages
3. Configuration of zone messages

4. Filtering lines for warning the controller
5. Calendar configuration
6. Configuration of voice types and frequency
7. Map data configuration
8. Incident types
9. Controller Authentication
10. Configuration of Vehicle Control Panel Messages
11. Configuration of Predefined Messages
12. Creation of Predefined Messages
13. Zone Indication Message to Buses
14. I/O Zone Warning Messages
15. Line Filter for which Warnings are sent to the Controller
16. Day Type Configuration, New Day
17. Day Type Configuration, Alter
18. Day Type Configuration, Search
19. Day Type Configuration, Seasons
20. Day Type Configuration, Results
21. Voice Time Configuration
22. Configuration of Reaction Times
23. Map Data

#### **6.7.2.1.5. PIS Display Configuration and Management**

1. Configuration Tools
2. Creation of Information Displays
3. Line Configuration.
4. Predefined Messages
5. Associating Predefined Messages with Displays

#### **6.7.2.1.6. Maintenance Requirements**

1. Device settings shall be updated including software/firmware updates through transmission via the secured communication network set up by the service provider. For reasons of security, device settings shall not be modifiable by field staff of the service provider/others.
2. Any device settings modifications including software/firmware updates as well as business rules such as fare settings, discounts etc. shall be done with prior authorization by ASCL/ACTSL. A digital log of all changes of settings on each and every device shall be maintained and delivered to ASCL/ACTSL.
3. Any faulty equipment shall be replaced with a tested unit from the spares maintained by service provider.
4. Repair and testing of equipment shall be done at the Service provider's maintenance center and not at site.

5. Only a maintenance engineer with maintenance access card shall be able to access maintenance mode of the device which shall allow the maintenance engineer to diagnose the faults and update the device settings directly, if required.
6. A repaired unit shall be tested for full functionality as at the time of initial deployment and certified before it is reinstalled at any site.

#### **6.7.2.2. Automated Fare Collection System**

This section describes functional specification and end use requirements for different components for AFCS. The functional specifications shall be the base requirement understanding given to bidders, however ASCL/ACTSL expects the MSI to on-board best practices and enable a highly integrated and automated operations environment.

The functional specifications section provides specification for major components for AFCS:

- Fare Collection and Validation Devices
- Integration with CARD management system and Central Clearing and settlement system of Financial Institution (Bank)
- Integrate with Common Transportation Control Center

The core objective of implementing AFCS is to create an integrated fare collection mechanism using interoperable standards, hence the devices and media thereby has to be complementary in nature. The end state requirement of this implementation shall be that of integrated fare management and collection regime which shall render its services to all types of transit system operated within the city in a unified manner. In-order to meet diverse need of commuter and application, following media types shall be offered to users for payment of fare purposes:

- Open loop EMV/RuPay with Contactless Smartcards
- QR code based Paper Tickets
- Mobile application based ticketing using QR code and NFC in future
- Mobile Wallet integrated with pre-paid account

**Mobile based ticketing:** Mobile based ticketing shall be used by commuters to book their tickets via mobile phone application. Mobile based tickets shall be based on secure QR code technology & NFC (Future)

**Quick Response Code (QR Code):** The QR codes shall be read by ticketing devices on bus HTT. QR Code based tickets can be generated on mobile applications and same can be used on ticketing devices for authentication. The paper tickets shall be printed along with QR code for authentication purposes.

The AFCS shall enable ASCL/ACTSL to dispense different types of tickets to its user's in-order to ensure all types of user (occasional and daily) needs are catered. The AFCS system shall offer ability to define integrated fare matrix and rules to be used on media and devices to ensure users can avail integrated ticketing facility irrespective of transit type used for commuting. The business rules shall apply to devices, media and integrated central applications deployed to achieve integrated and automated fare collection system.

## **Bus Terminals and Ticketing Devices**

The Bus Terminals ticketing facility shall facilitate the commuter travel by providing an ecosystem for the issuance and acceptance of fare media. The Bus Terminals ticketing facilities shall consist of the following:

**Point of Sale:** The POS shall offer functionality to conduct the activities like issuing open loop based smart card, QR code based paper tickets, topping up of the open loop smart cards and handle customer queries related to ticketing. POS shall have ability of ticket issuing / cancelling / refunding / adjusting etc. POS should be able to read and write from all the fare media as defined in the business rules.

**Handheld Ticket Terminal (HTT):** Hand held electronic ticketing terminals shall be deployed for checking/ validating the fare media with the commuters and shall be used by station AFC staff for issuing QR code based paper tickets and also using open loop card wallet. This equipment is a portable hand held device to facilitate the ticket checking capability as well.

**Mobile App for ticketing:** Mobile application (Android/iOS/Windows) shall be developed to enable users to generate secure QR based tickets for use on ticket validation devices. The mobile app shall also be connected to mobile wallet for purposes of app based payments for parking etc.

**Bus Terminal Server:** The Bus Terminals server shall reside at the terminals and acts as a bridge between the terminal ticketing equipment's and the Central AFCS. The terminal Server shall control and manage the AFCS processes at the terminal.

**Central system of AFCS:** The Central system shall consist of the AFC transaction & Configuration Application integrated with a smart card host system provided by Financial Institution (Bank). The system shall be used to set configuration parameters (such as tariff tables etc.) that would be required to operate the system. The smart card host system provided by Financial Institution (Bank) shall be hosting the transit smart cards and perform key management for all the AFC devices. The system would host all the information required for processing the fare media within the transit ecosystem. It shall function as a Management Information System (MIS) and also as a communication layer.

The Smart Card based AFC system architecture as described above need standard specifications and interfaces defined at card, reader and smart card host level to work seamlessly in tandem with each other and in a secured manner.

**Other interfaces with AFC:** The Central system of AFC system shall be interfaced with following external systems:

**Central Card Host (CCH) & Central Clearing House System (CCHS):** The AFCS smart card transactions shall be transmitted to CCHS of bank and the settlement shall be carried out by bank.

**Banking Interfaces:** The banking interfaces shall be required for enabling top-up channels like POS, Mobile banking, Payment Gateway and service delivery points etc. The banking interfaces shall also be used for customer service and required API's shall be provided by Financial Institution (Bank).

### **6.7.2.2.1. General Requirements for AFCS**

The equipment supplied by Bidder shall:

- Shall have design life period of at least 10 years in terms of technology, upgrades and scalability
- Aid maintainability and reduce the requirement for spares
- Use interchangeable modules which shall be accessible for prompt exchange or repair and up gradations
- The system shall be designed to attain the ASCL/ACTSL requirements as required in this Specification.
- AFC system shall be designed to process open loop Contactless Smart Cards, QR codes and NFC. All Contactless EMV readers should support EMV level 1 & applicable EMV Level 2 standard for Contactless EMV media including card or NFC mobile application.

ASCL/ACTSL seeks an Open Architecture Solution for the AFC system with following elements:

- Adherence to International and National standards and practices for the industry. (Published and maintained by organizations such as EMV, ISO, CEN, and ISI etc.).
- Interoperability - To ensure that ASCL/ACTSL shall be able to participate in an open loop Smart Card market including other transit systems

The proposed solution (hardware and software) shall ensure:

- Vendor-independent delivery of modules / equipment as far as possible.
- Use of Standard Commercial off the Shelf products and software, encouraging use of non-proprietary items.
- Proven hardware platform: The system needs to be flexible and configurable designed to allow future adaptation in a multi-operator environment and government policies.
- The attainment of the reliability, availability, maintainability and safety requirements of the system shall be verified by analysis, testing and system demonstrations as required in the Specifications.

#### **6.7.2.2.2. Systems and Equipment's**

The scope of supply shall include all necessary hardware / equipment, software, accessories, materials, documentation and facilities necessary to meet all requirements of the AFC system for the required terminals. The proposed AFC system comprises of all equipment associated with the AFC system including (but not limited to):

1. **Terminal Equipment's:** Provide local fault monitoring of the AFC installation, traffic statistics and revenue reports etc. The workstation shall also comprise of any additional hardware/ software required to complete the AFC ecosystem.
2. **Issuance Infrastructure:** This shall comprise of setting up the issuance infrastructure at the POS and provide ticket top-up and validation machines. The issuance setup at the POS shall comprise of equipment required for issuance of fare media.
3. **Fare Media Acceptance Infrastructure:** This shall comprise of open loop contactless readers, QR based paper ticket readers and readers to process mobile based ticketing media. The infrastructure shall also help resolve any queries related to the functioning of the fare media. This infrastructure shall be made available at the Automatic Gates, POS etc.



4. Cable routes, earthing and equipment fixings up to designated interface points
5. **Local Area Network (LAN):** This shall comprise of networking of the systems including, but not limited to, point of sale, servers and all network equipment's necessary for operations. Complete Terminal level networking works and network equipment like Switches, Routers including Ethernet, ties, conduits, legends, terminations, other accessories, and all fixing and termination accessories.
6. **Terminal Server:** Terminal server shall be the Terminal level AFC management application responsible for monitoring terminal level equipment, generating terminal level reports, receiving usage data from terminal level equipment, sending control command and downloading system parameter & ticket price list to terminal equipment's from Central AFC system.
7. Interface to the Central Smart Card based AFC system and Station AFC equipment and infrastructure.

#### **6.7.2.2.3. AFC Central Computer**

1. Central AFC Application shall be centrally hosted control center on servers and other hardware/software components for data/application/keys configuration on all AFC devices & equipment, Transaction Processing, generating detailed summary reports of ticketing and travel for ASCL/ACTSL management, Controlling and monitoring the AFC ecosystem.
2. In addition, Key Management function through necessary hardware and acceptance & management of the fare media processing and security as per business requirements at reader level shall also be a basic function expected of the smart card host solution.
3. It shall also act as a communication bridge between the external peripheral systems and Terminal Server.
4. AFC application software shall be preferably web-based software, which could be accessed from any-where, anytime, by authorized users with proper authentication and authorization.
5. Local Area Network (LAN) and Wide Area Network (WAN): All AFC Equipment and terminal server should be interconnected on LAN. Inter site communication between central server and a terminal server is to be carried out using appropriate available Wide Area network. Other external communication like bank gateway, other applications can also use WAN.
6. Provisioning, fixing and arranging of Cable routes, earthing and equipment fixings are to be done by the MSI.
7. ASCL/ACTSL AFC system shall Interface internally with the Terminal Server equipment, AFC devices and with the smart card host.
8. Smart Card Host (to be supplied by Financial Institution (Bank) of ASCL/ACTSL): This system shall issue contactless open loop fare media. This system would undertake all functions required for issuance of media, transaction processing, card life cycle management, security etc. associated with open loop fare media and shall interface with



ASCL/ACTSL Central AFC system for acceptance of usage data and key management. This shall also include sending the configuration parameters and data for keys, black list etc. to the AFC system wherever applicable.

9. All equipment / items associated along with any interfaces required to ensure operation within the performance requirements.
10. Maintenance Spare Parts, Special tools and test equipment.
11. Scope of Software Supply shall, as a minimum but not restricted to, include all software required for the AFC system including:
  - a. Development/Customization of AFC application software;
  - b. Application Programming Interface (API) software;
  - c. Simulator software;
  - d. Antivirus software, etc.
12. The Bidder shall supply to ASCL/ACTSL all software solution relevant to all of the AFC equipment, for AMC's staff to carry out successful ticketing operations.
13. Bidder shall provide detailed interface specifications for following interfaces (API's, DLL's Documentation):
  - a. Smart Card to Smart Card Reader
  - b. Fare Media to AFC Equipment
  - c. AFC Equipment (POS) to Terminal Server
  - d. Terminal Server to Central Server
  - e. Smart Card Host to Central Server
  - f. Various external agencies (Bank, gateway, applications)

#### **6.7.2.2.4. Integrated AFCS Management Platform**

ACSL/ACTSL through CCPS project implementation intends to develop a city wide integrated payments platform and collection system which is automated and based on electronic media. The system shall be utilized by transit system within Allahabad city and other service providers within ASCL/ACTSL/AMC and outside to deliver integrated and seamless travel and payments experience to its citizens. The system is expected to act as a city platform and allows individual services to leverage the common payments and fare management platform. The common system shall deliver workflow and rules management capability so that individual systems can manage their operations compliant to their functional requirements.

The MSI shall be required to implement central payments and automated fare collection system in a way that shall have provisioning capability to on-board functionality based on the user requirements in automated manner. The integration shall be facilitated by publishing open interface protocols so that diverse set of hardware technologies can be integrated into the system.

The system shall provide capability to individual users based on workflow, rules and authorization to carry out business functions designated for the user types.

The central operation management platform shall create unique operational capability for individual stakeholders to meet their operational requirement and hence augment their operational capability to better respond to the service requests.

The system shall provide interface with Financial Services for central clearing system, card supply, card management and security management via SAM devices.

#### **6.7.2.2.5. Operational Requirements**

1. ASCL/ACTSL AFCS shall operate in compliance to the requirements of Business Rules of transit and other application areas and shall be designed to readily accommodate future modifications to the Business Rules.
2. The MSI shall make available the necessary AFCS solution to ensure smooth operations by the ASCL/ACTSL staff
3. MSI shall provide technical maintenance and support from the software throughout the tenure of the project whereas provide maintenance and support for the hardware till the defined contract period for hardware.
4. MSI shall propose and, if agreed by ASCL/ACTSL, develop applications to cater for future business rules of ASCL/ACTSL implementation areas.
5. Bidder shall liaise with ASCL/ACTSL during design stage to establish all configurable parameters.
6. Parameters appropriate to operating features of AFC system shall be easily configurable in order to implement modifications, as required, throughout the lifetime of the installation.
7. It shall be possible for such changes to be performed at the AFC Central Computer with facility provided to allow the changes to be downloaded to the station equipment through Station server and become effective at a specified future date.
8. The terminal equipment shall send an acknowledgement to the AFC Central Computer for the acceptance and validation of the new Equipment Operating Data parameters through terminal Server.
9. The AFC central system shall be able to distribute global Equipment Operating Data parameters so as to ensure smooth and uniform operation at each terminal regarding system performance, design functionality and passenger traffic, etc.
10. The total time required to download configuration parameters from the AFC Central Computer to all terminal devices shall be a maximum of thirty (30) minutes.
11. During the parameter download, the terminal equipment shall be able to operate normally and the transitioning time to switch to new operational parameters shall not affect normal operations.
12. Terminal equipment shall retain in memory at least the most recent two versions of configuration parameters and it shall be possible to switch back to previous version of Equipment Operating Data, if required.
13. In the event that the calendar expires the system shall continue to operate using the latest set of parameters.
14. MSI shall establish and implement leading practices of IT service Management like Information Technology Infrastructure Library (ITIL), International Organization for Standardization (ISO)/IEC 20000 standard, which shall promote the adoption of an

integrated process approach to effectively deliver managed services to meet the requirements of ASCL/ACTSL

15. MSI shall identify all assets and document the importance of these assets. The asset inventory shall include all the information necessary in order to recover from a disaster, including type of assets, format, location, backup information, license information etc.
16. MSI shall undertake scheduled and ad-hoc maintenance (on need basis) and operations like Data backup, replication, patch management and upgrades as per ASCL/ACTSL standards
17. When implementing the operational requirements, the MSI shall ensure that all associated security/ frauds problems are addressed.
18. The AFC system for ASCL/ACTSL shall be a cyclic system that requires checking of tickets both at entry and exit gates.
19. MSI should supply AFCS Equipment so as to aid maintainability and reduce the requirement for spares; all AFCS Equipment shall use interchangeable modules. Modules shall be accessible for prompt exchange or repair. Modules performing identical or similar functions in AFCS Equipment shall be mounted in the same location within each cabinet and shall be physically and electrically interchangeable as far as possible.

#### **6.7.2.2.6. Ticketing Scheme Rules**

1. MSI shall note that a copy of ASCL/ACTSL's preliminary business rules of this particular specification is only for reference purpose. The MSI shall enhance and give necessary support to ensure that the business rules document contains the best practices and is in a format that supports relatively easy customization and upgrade of the application software provided by the Bidder.
2. AFCS application software shall result in a design which, when implemented, at site shall be fully compliant with ASCL/ACTSL's business rules.
3. Design of the application software shall be highly flexible and easy to implement so as to easily accommodate future changes to the business rules including specific requirements to accommodate future / integration with extensions to ASCL/ACTSL and interworking, via CCHS, with other modes of transport provided by various service providers.
4. MSI shall be responsible for optimizing the business rules, in conjunction with ASCL/ACTSL, to a final version within time frame mentioned in RFP document, or an alternative date to be agreed mutually with ASCL/ACTSL. However, the MSI based on the preliminary business rules, without impinging upon project program or cost, shall develop the necessary software.
5. The Business Rules shall define the use of the fare collection system which shall, as a minimum, include the following:
  - a. Operating day;
  - b. Fare structure whether flat, distance based, time-based or zone based;
  - c. Fare products concerning the range of tickets available for purchase by commuters such as single journey, return journey, multi-ride, daily, weekly and monthly season tickets;

- d. Fare levels concerning the price of each fare product and any restrictions on use, such as outside rush-hour;
- e. Fare based on media concerning the particular technology used to process ticket transactions for different types of fare media like RPT, QR code, Mobile based NFC ticketing and EMV smart cards.
- f. Payment options available for fare product purchase such as by cash, credit, prepaid and debit card;
- g. Locations where fare products may be purchased such as Ticket Vending Machines, Ticket Offices, Internet Sales and Mobile based sales; etc.
- h. Policy on excess fares and locations for excess fare payment;
- i. Procedures for handling customer service including information and complaints;
- j. Sales issues pertaining to refunds and credits;
- k. Exceptions related to fare media performance and errors concerning transactions;
- l. Rules for issue and initialization of fare products;
- m. Refunds, deposits, receipts, charges, discounts and penalties;
- n. Category of commuter with appropriate rule such as for pensioner, children, maintenance staff, etc.
- o. Interoperability with other modes of transport;
- p. Handling of degraded and emergency operation, etc.

#### **6.7.2.2.7. Tickets**

Smart Card based AFC system shall use following type of recyclable tickets in the system of ASCL/ACTSL:

1. **Contactless EMV Smart Card:** For multiple journey, Staff pass and other tickets retained by the passenger. MSI shall provide dual interface EMV smart cards that could be used as contactless card within metro and could also be used as a Contact or Contactless media on the other EMV terminals within the country or internationally
2. **Quick Response Code (QR Code):** These are the QR codes that can be shown on AFC system (Ticket validation machine) for validation. QR codes should be generated using the mobile application or web based application for one-time journey. QR Code can be downloaded on to smart mobiles phones through web or mobile application portal. QR code can be printed on plain paper (other than station premises) where the passenger has made payment on web application.
3. **Near Field Communication (NFC) based (future)**
  - a. The Issuance ecosystem shall be designed to enable other emerging fare media technologies like Near Field Communication (NFC) to be introduced
  - b. Compatible with ISO/IEC 14443 and 18092 and compliant to associated international standards, with absolutely NO disruption to working systems.
  - c. The Financial Institutions shelling to roll out such media shall do so along with ASCL/ACTSL and the acceptance readers, provided by MSI as part of this project, shall be able to read such media.

#### **6.7.2.2.8. Fare Products**

##### **1. Fares**

- a. The Smart Card based AFC system shall be designed to accommodate and configure, as required at locations and assets mentioned in BOM.
- b. Each ticket type shall have its own downloadable fare table.
- c. For a fare table change, it shall be possible to download the new fare table from the Central Smart Card based AFC system server ahead of implementation date.
- d. The Smart Card based AFC system shall make provision to maintain an accurate current calendar covering a minimum period of next 12 months.

##### **2. Open Loop Prepaid**

- a. It is a limited duration fare media (prepaid card or NFC media) issued to carry fare products and e-purse.

##### **3. Weekly/Monthly Pass**

- a. Unlimited Journey during validity. The Pass could be issued on an EMV card and NFC media and should be capable for the following:
  - Fixed Origin (Station)-Fixed Destination (Station)
  - Any Origin (Station)-Fixed Destination (Station)
  - Fixed Origin (Station)-Any destination (Station)
  - Fixed Zone (origin) - Fixed Destination (Zone)
  - Fixed Zone (origin) - Any Destination (Zone)
  - Any Zone (origin) - Fixed Destination (Zone)
- b. The Smart Card based AFC system shall, in the future, be able to readily process any other ticket type as defined by the Business Rules appropriate to integration between ASCL/ACTSL, future extensions to ASCL/ACTSL and inter-working between the future networks provided by other Service Providers.
- c. All ticket types shall be distinct in color and style in accordance with a format to be agreed with ASCL/ACTSL.
- d. All smart card types shall be suitable for personalization like incorporating a photograph of the user and carry the required logos of the required stakeholders.

##### **4. Operating Day**

- a. For revenue reconciliation a distinction shall be made between the consecutive operating days (extends from midnight to midnight).
- b. The Smart Card based AFC system shall support overnight operation to avoid inconvenience to passengers who enter the system before midnight and exit the following day after midnight,
- c. The tickets issued before midnight shall be valid up to 05:00 Hrs. of the following day.

##### **5. Blacklisted Tickets**

- a. The ICCC shall allow the operator to enter a list of blacklisted tickets. These tickets IDs shall be downloaded to the AFC equipment at Terminals from ICCC.
- b. Provision is required to enter the blacklist ticket as series.

- c. AFC POS/validators shall reject blacklisted tickets for add value functions and display the reason to inform the operator. Each detection of blacklisted ticket shall be recorded at the terminal Server and ICCC.

## **6. Special Modes**

- a. It shall be possible to operate the system in following special modes through Terminal Server, ICCC:
  - Time mode override: Time check in system is bypassed
  - Entry / Exit override: Entry/exit check in system bypassed
  - Station Close: Entry gates are closed
  - Emergency Mode: All gates become open
  - Incident Mode No amount deducted from Smart Cards. No entry/exit bit is marked.

### **6.7.2.2.9. AFCS Central Control System (CCS)**

1. The central control system represents the operational center of the transport service where AFCS application system shall be used to manage inputs from the field devices, the fare management systems, fare matrix/tables database etc. Information retrieved by the control center from the field AFCS devices shall be processed by central AFCS application for consolidation and settlement purposes. The center shall also act as central payments management center for the purpose of administrative and process controls and information delivery.
2. The central control center shall act as a nerve center for the purposes of revenue operations management for the city related to services connected to AFCS services. The systems implemented as part of AFCS allow variety of technical and operations profiles to be deployed to manage management needs on real-time basis. Some of the profile types are such as fare controllers, incident managers, back office reconciliation and reporting etc. including the technical staff ensure business services are delivered as expected and in-event of exceptions, the same are managed to reduce any impact on operations and business.
3. The job involves monitoring and maintaining operational functions of an electronic reporting facility requiring the ability to monitor and maintain a range of electronic & software services, security and telecommunications systems, receive, interpret and transmit information and determine responses to incidents and; monitoring the security of persons and infrastructure from a control room perspective requiring the ability to effectively operate security systems to monitor activities, co-ordinate appropriate responses to incidents and organise relevant procedures via stand operating procedures.
4. Some of the common functions carried out at CCS are:
  - Monitor and maintain electronic & software systems
  - Process and organise data
  - Respond to incident
  - Prepare for operations
  - Monitor security activities

- Maintain systems and information
5. The Central Control System shall act as the integration and common ITS and financial services infrastructure management center which includes central applications, computing infrastructure and communication system. CCS shall enable data and information from all AFCS and other services linked equipment's installed at Bus Depots/ Buses / Bus Terminals and other locations to be collected and processed for requirements mentioned in the scope of the implementation.
  6. The CCS shall process data in real time and schedule basis based on the process requirements from all the equipment through an online connected compute infrastructure to enable service delivery functions, service control and management, compliances and planning purposes.
  7. The MSI shall consult with the ASCL/ACTSL on proposals for the type and range of operational and maintenance information to be prepared. The final content and format of presentation of processed data shall be discussed and finalised with ASCL/ACTSL. All process as may be agreed between ASCL/ACTSL and MSI at requirement finalization stage shall be process in term of SOP's and implemented on the integrated platform using appropriate applications within the scope of implementation.
  8. The operator interface to the CCS shall facilitate operations management, reporting and service delivery based on the individual functions identified for such resources.
  9. A hierarchical access control system shall be incorporated across the system to ensure that persons can only gain access to the information or facilities that are relevant and authorised to their specific job.
  10. The CCS shall be capable of connectivity with various suitable communication service providers providing GPRS / CDMA / fixed line like broadband and leased lines. All communication networks shall be set up, managed and maintained by the service provider through appropriate contracting terms with communications service providers.
  11. The CCS shall download configuration data to the fare management equipment's through terminal servers and OTA/physical in case of handheld / mobile devices for updating purposes. The information shall include system parameters, fare tables, blacklists, device parameters date and time synchronisation, sub-system application updates and employee identification number and password updates etc. The CCS shall also manage configuration, security and processes for other equipment's deployed at various locations under the scope of this RFP
  12. The CCS shall be designed for autonomous operation of the various components of the AFCS & other payment services to ensure that a failure in any one component of the system shall not disrupt the system as a whole.
  13. The CCS shall also provide stand-in facilities, in the event of prolonged communication failure with the systems.
  14. Depot configuration data files on the CCS shall be copied onto a backup media and hand carried to the Depots for Bus devices, if necessary.

15. The central control center, fare & payments controllers should be provided with multi-screen option to perform analysis and event tracking in a way that data collaboration can be done.
16. The system should additionally provide ad-hoc query based interface for the analysts to perform complex analysis. The system should provide functions to create new analysis / reports based on the user needs and same shall become part of the user report bin.
17. The Central Control System shall generate the necessary management reports from all transaction information received from the field equipment's.
18. The CCS shall automatically collate all operations data; authenticate security features of operations data from the AFCS to provide secure and accurate audit and traffic statistics for the Buses / Routes of the depot.
19. Controllers shall be responsible for ensuring effective delivery of transit services to customers through responsible supervision and communication with ticketing operators. Controllers are responsible for direct supervision, prudent communications and support of operations service transit staff with regards to safety, service, scheduling and detailed documentation. Goals are to ensure a high quality transit service to customers, while maintaining a safety-first environment and cost effective system.
20. The CCS shall be responsible for fare and payments management services, communications, utilization of transit supervisors, spontaneous decision-making, answering phone calls, performing detailed data entry, and overall revenue management of Public Transit operations.
21. The CCS shall maintain duties including Help Desk and support functions, with a complete working knowledge of the revenue management systems and also about the electronic ticket products. CCS Staff must be knowledgeable of work rules, transit contract parameters and be proficient with Microsoft Windows Applications. CCS Controllers work closely with and in support of Bus Operators, Transit Supervisors, and any other contractor or city department / personnel, to ensure a high quality customer service experience to citizens. Primary Controller duties include; responding to all communications in a professional and helpful manner, ensuring that actions taken are quick and effective in handling the variety of situations that occur on a daily basis, including routine and emergency situations. Controller duties involve a high level of stress, while maintaining composure, professionalism and courtesy. Controllers are responsible for making on-the-spot analyses and decisions within the realm of authority, transit policy, contract terms and agreements. Controllers work varied hours, days and shifts, and may fill in as necessary. Controllers shall perform other CCS related duties as assigned.
22. The system should be able to provide decision support system to the control center managers to dynamically manage revenue systems.
23. The CCS shall communicate with field fare management devices via appropriate network and process the data received to provide overall audit, statistical and operational information.



24. The bidder shall consult with ASCL/ACTSL on proposals for the type and range of maintenance and financial information to be prepared. The final content and format of presentation of processed data shall be submitted to ASCL/ACTSL for approval.
25. The operator interface to the CCS shall facilitate the preparation of ad-hoc reports and shall permit both scheduled and ad-hoc reports to be produced with data corresponding to user selectable short time periods within an operating day.
26. A hierarchical password structure shall be incorporated to ensure that persons can only gain access to the information or facilities that are relevant to their specific job.
27. The data transferred from the Terminal Server and handheld devices to the CCS shall include, as a minimum, information such as usage of various equipment, number and cash value of all classes of fare media issued and applicable media topped up, POS shift revenue, fault reports and terminal of origin and destination traffic data by fare media types.
28. The CCS shall have facilities to generate and update blacklists for all applicable fare media and to download these lists to the field devices.
29. The CCS shall download parameter data to the Terminal Server for updating. There should be provision to transfer EOD parameter all or selected devices. The information shall include system parameters, the fare tables, validity times, date and time synchronization, blacklist and employee identification number and password updates.
30. The CCS shall download program files to the Terminal Server including updates to operating software modules, graphics files, look up tables etc., in addition to parameter files. The CCS shall be able to support applicable fare media replacement and refund applications from POS.
31. If smart card is corrupted, the operator shall input its engraved or printed card identification number to retrieve the recent usage of the smart card together with the remaining value, unused number of trips or expiry date depending on the class of smart card.
32. The CCS shall also provide fall-back facilities, in the event of prolonged communication failure with field devices. Configuration data files on the CCS shall be copied onto a backup media and hand carried for field use, if necessary.
33. Revenue data from field devices shall be copied onto a backup media and hand carried to the CCS for input. The CCS shall be able to read the station data from the backup media store the data in temporary files and merge the data with other station data.
34. All critical alarms shall be transmitted to the CCS in real time.
35. The communication network shall be equipped with built-in error detection and transmission retries to ensure accuracy and dependability of data transmission.
36. A cut off time shall be agreed with the ASCL/ACTSL to define the end of one operating day and the beginning of the next for data consolidation and reporting purposes.
37. The MSI shall propose and define the sequence for end of operating day processing including the time allowed for the printing of reports that are required on a routine basis.
38. The Central Computer System shall include, but not be limited to, the following main units:
  - a. Complete Central System with required data servers, application servers, Middleware etc.
  - b. Archiving mechanism

- c. Equipment management
  - d. Key Management System provided by Financial Institution
  - e. Network management console
  - f. Local Workstation
  - g. AFCS LAN at CCS
  - h. Any other equipment as per finalization of design
39. The software provided shall include a package consisting of computer operating system software, diagnostic, testing, development and support software and AFCS application software, including software to manage and safeguard security keys for smart cards and software for the generation and modification of report contents and presentation.
40. Corresponding software shall be provided for all CCS Workstations to ensure that all features of the CCS are accessible at all locations through web browser interface in accordance with user access rights.
41. All reports shall be generated in a form that can be easily exported to Microsoft Office application format for off-line storage, analysis and editing.
42. The output reports from CCS shall be available in the standard format like Excel, CSV, XML, PDF, etc.
43. Security features shall be incorporated to prevent tampering with any data, programs, or other facilities of the CCS.
44. All computer software documentation for the CCS including workstations shall be provided by the bidder. The documentation shall include system requirements analysis, system design, program descriptions, listings, source and object files, flow diagrams, methods of execution and other necessary information, as required by the Employer. This information shall be supplied prior to the start of production of software documentation.
45. Password hierarchy shall be setup for different operator access level.
46. The CCS shall be capable of checking and handling exception, missing, duplicate, delayed and fabricated data.
47. The CCS shall maintain and download the AFCS parameters to the field devices. The AFCS parameters to be maintained shall include, but not restricted to the following:
- a. System parameters
  - b. Device parameters
  - c. Fare related parameters
  - d. Fare media ticketing related parameters and
  - e. Blacklist tables (Derived for Financial Institution System)
48. Parameters shall have an effective date and time which may be any time in the future or in the past such that they are applied with immediate effect. If the effective date and time is set in the future, these parameters shall take effect on the specified date and time without further operator intervention.
49. The AFCS shall be able to handle at least two versions of future parameters. However, there shall only be one current parameter list in the system and the system shall ensure that only one version of parameters takes effect in the system at any one time. Once the parameters take effect, they shall be locked to prevent any modification.

50. The system shall allow only authorized staff to maintain parameters. A facility shall be provided as part of the CCS whereby the operational parameters can be modified and once verified can be transmitted to the field devices for implementation at a date and time to be specified. It shall be possible to use back-up media to allow for change in operational parameters to be implemented in the event that the communication links are down.
51. Parameters shall be grouped in files according to the different levels of validation required such that, for example, gate over ride parameters can be sent separately from fare tables and without the same level of validation.
52. The design of the database system shall be arranged to keep track of all valid fare media in circulation. This information shall aid in reporting any abnormal usage of stored value or trips and in providing refunds for corrupted fare media.
53. The database system shall satisfy the following requirements:
  - a. Full-function, RDBMS based on SQL or any other recognized database
  - b. Support complicated data structure, multi-user, multiprocessing, large capacity operation
  - c. Offer data integration, data recovery and security
  - d. Support parallel processing
  - e. Provide disk mirroring functions
  - f. Authority control shall be independent of that of the operating system.
  - g. Offer multilevel safety management of database.
54. Data storage capacity shall be sufficient to maintain a minimum of six months transaction data available on line for ad-hoc report generation and other investigations.
55. The volume of data to be calculated for this requirement shall assume current transaction size of over 1 lacs transaction per day to 5 Lacs transactions per day.
56. To maximize the utilization of the disk space of the system, system data shall undergo a regular housekeeping process. Housekeeping shall cover the files created by the CCS and the files relative to each subsystem.
57. Any outdated or invalid files shall not be archived. Duplicated records in the database and records where only the latest data need to be retained shall be merged and archived.
58. The system shall be able to backup and recover data according to different modes and periods of backup required based on their criticality and data volume.
59. It shall be possible to restore archived data covering periods up to six (6) months at a time and use this data for the preparation of ad-hoc enquiries and reports.
60. The system shall have the functionality to backup and recover all key data (usage data, system data) and files.
61. Data to be transmitted from AFC equipment to the Terminal Server and further to CCS shall be divided into the following categories.

Transaction Data	Accounting and statistical data including cash accounting, ticket sales, passenger traffic, gate data, origin and destination data etc.
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Audit Data	Details of audit data of each machine including data of non-resettable registers
Status Data	Status data including faults, maintenance alerts, mode of operation Alarms, Events and Warning data etc.

62. Data shall also be downloaded from the CCS facility to the filed devices. This data shall be operational and security data type. The data to be locally managed at CCS shall be Control and Maintenance Data.

63. System should have inbuilt process to ensure completeness of data from different levels.

Operational Data	EOD such as fare tables, date and time, peak and off-peak, promotional features, discounts etc.
Security Data	Security data shall include keys and list of black listed tickets.
Control data	Modes of operation of equipment and station

64. MSI to propose and follow secure equipment management of all AFCS devices including new equipment registration, equipment removal or deletion.

65. Identification and blacklisting of fraudulent, stolen / lost equipment.

66. Security requirements: - Security shall cover following aspects applicable to Smart Card based AFC system Physical protection of equipment

- a. Security of data and transactions
- b. Support for symmetric and asymmetric keys
- c. System security
- d. Protection of revenue
- e. Security of cash through audit trails

67. The AFCS devices shall resist tamper by either passengers or unauthorized staff of the ASCL/ACTSL's representative or unauthorized access by staff.

68. Valid identification shall be required before opening any machine containing cash or tickets.

69. All devices shall have locked enclosures to satisfy the overall security requirement.

70. All fare media shall be protected from being tampered with during the period that they are being processed within a device. It shall be impossible to substitute a ticket or card and validate it once a transaction has been initiated.

71. The system shall provide multiple sets of keys for every equipment. Similar equipment shall be keyed similarly. The keying arrangement shall be with the approval of the ASCL/ACTSL's authorized representative.

72. The System should also provide two factor authentication system via user and biometric authentication services for POS device operations. The software should provide biometric based enrolment system for the POS operators and same should be used to allow the users to login into the ticketing device.

73. The AFCS devices and system shall provide a complete audit trail of all transactions, transfers of cash and other payments.
74. The equipment shall be designed with features, which deter possibility of revenue losses from altering, copying or counterfeiting of the tickets.
75. Unique ticket id - Fail-safe features shall be incorporated to check that no duplicate ticket ids are introduced in the system, either through hardware or software failures. System shall address any other fraud mechanism for revenue erosion from automatic fare collection and accounts system. Sufficient security shall be provided to prevent an increase in the remaining value of the ticket except at machines having revaluation function.
76. System design shall ensure protection from unauthorized access and changes to the systems and software. All software / firmware supplied by the bidder shall be free of virus. Suitable mechanisms to handle any possibility of system being infected by any virus shall be incorporated. Up gradation of such measures, from time to time shall be the responsibility of the bidder.
77. The CCS shall generate specific reports automatically at end of day. The CCS shall collate, format and enable end of day and ad-hoc reports to be printed from the data transmitted by the various AFCS Devices. Data shall be stored in a relational data base structure to permit ad-hoc and detailed log reporting. All reports to be read only and printable in PDF format. Option to change in MS Excel format is also required.
78. The MSI shall finalize report design during design review with the Employer's engineer. Suitable web intelligence software for accessing reports remotely shall be provided.
79. The reports shall include but not be limited to:

Daily Summary Report	Summary of all ticketing, financial transactions / cash received or refunded. Station wise, ticket wise
Shift consultancy reports	All ticketing, financial transactions. Each transaction with date and time stamped.
Aggregated /Consolidation reports	All Transaction based, Audit registers based and Revenue figures.
Traffic reports	Entry/Exit Gate passenger flow. Ticket wise, station wise
<b>Individual ticket transaction history</b>	
Operator action reports	
Log reports	Chronological report of daily activities. Each event shall have date and time recorded.
Paper Ticket stock inventory reports	Detailed reports for global stock position, location wise stock reconciliation

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Equipment inventory	for equipment installed and removed
<b>Events, alarms, warnings</b>	
Quarterly stock position	Station ticket stock report by 15 minutes frequency
Quarterly Traffic	To calculate number of passengers at station or access at that time Traffic report by 15 minutes frequency and passengers in and passengers out per 15 minutes frequency throughout the operating day, with sub-totals for each hour and grand total for the day.
Reliability analysis (for reliability, accessibility, maintainability measurements)	For MTTR, MTBF, MCBF
<b>Maintenance and failure reporting</b>	
System reports	System configuration related
Non AFCS revenue	Station wise as well as at CCS level
Any other report required by ASCL/ACTSL's representative.	

80. Complete list of reports shall be finalized during design phase.

81. Event log, chronological report of daily activities by item of Station Level equipment. Each event shall have date and time recorded.

82. The purpose of the functionality is to provide an efficient revenue management system for ASCL/ACTSL. Central system shall have feature for automatic generation of daily, monthly & yearly reports for revenue reconciliation using the revenue data - transactions, audit register and cash amount. Reports shall be generated global, station wise, operator wise and shift wise.

83. It shall provide a transparent account of revenue figures. Any discrepancy highlighted in revenue figures reconciliation shall be visible in the detailed reports.

84. Customized reporting tool for detailed periodic reports for maintenance log - failure information, corrective action, faulty / replaced module (with unique serial no.), calculation of MTTR, MTBF, MCBF etc.

85. It shall include inventory flow and management feature - Account of movement and stock of faulty, replaced, repaired, workshop and spare equipment / modules.

86. The MSI shall supply the hardware and software for automatic top-up of smart card through credit cards/debit cards or similar banking instruments. Automatic top-up of smart card shall be possible on reaching a predefined threshold value. Operational mode and requirements are to be defined in co-operation with bidder s and credit/ Debit card providers or other Banking Channels.
87. Top up via a dedicated website by use of a credit or debit card shall be included. Hardware, software and website design shall be provided by the MSI.
88. Test platform system of suitable configuration shall be included in the CCS delivery. This facility should allow ASCL/ACTSL to test the system end to end. It shall include all software, hardware, simulators and interfaces required for the purpose of system testing (before deployment) and future modifications and upgrades.
89. AMC has the objective of integrating the use of the AFCS with other transit and non-transit service providers. Fare and service integration of all transit systems. Also, the integration shall be required with the Central Clearing House capable of financial clearing with Payment Schemes like Visa or MasterCard or RuPay.
90. Bidder shall make all necessary provisions in the AFCS in order to achieve this objective.
91. Bidder shall provide an external interface and integration manual ("External Interface and Integration Manual") which shall detail the features of the AFCS, interface points, protocols, software and hardware requirements for interface and integration with other service providers together with guidelines and other requirements for integration and testing of the AFCS with other service providers.
92. The bidder shall make provisions in the design and manufacturing of AFCS equipment for necessary compatibility with the use of mobile technologies like QR code and NFC to enable usage of mobile phones as fare media.
93. To this end, the acceptance readers installed at bus station and buses shall be compatible with EMV Level 1 & 2, QR code reading and mobile NFC ticketing technology.
94. The CCS has to interface with Bank Server and with Bank Payment Gateway for recharging of smart card through different Banking Channels. The solution shall be capable of interacting with multiple banks using specifications of a particular scheme (Visa, MasterCard, RuPay).
95. The Smart Card Host system shall is required for Issuance and life cycle management of the smart fare media. The Smart card host would as a minimum perform the following card management functions:
  - a. Cardholder management
  - b. Media Stock Management;
  - c. Smart Media Tracking Management;
  - d. Transaction Management;
  - e. Key management
  - f. Terminal management
96. The Smart Card host (SCH) shall be equipped with facilities to manage the database of users who have personalized smart media. The SCH should have provision to keep documentation as required related to personalization.

97. The Bidder shall propose the commuter data, which the SCH shall store during the design phase. The SCH shall automatically manage the commuter's information according to the status of the smart media it is associated with. When a Contactless Smart Media record is removed from the database, due to expiry or refund, the SCH shall remove the commuter's record as well by capturing the history at relevant database.

**98. Transaction Management**

- a. The SCH shall acquire the transactions from the fare media acceptance infrastructure and authenticate the fare media as and when required. The smart card host shall actively update its contactless smart media blacklist table by removing contactless smart media IDs when the smart media has been blocked physically from further usage and top-up.
- b. It shall be possible for operators at POS Machines in stations to unblock certain blacklisted smart media's upon meeting certain pre-defined criteria.
- c. Under such circumstances, the bidder shall provide suitable mechanisms and advice a suitable solution in its response, whereby the unblocked smart media is available for immediate use throughout the smart card based AFCS

**99. Key Management Shall be provided by FI appointed by ASCL/ACTSL**

100. The SCH shall provide key management system for management of keys and certificates throughout the lifetime of the AFCS. The Key Management System shall be responsible for the generation, maintenance, secures storage and distribution of all cryptographic keys, system key materials and security variables.
101. The Key Management System shall also perform the initialization, including key injections, of security components in the system such as the Secure Access Module (SAM) through a remote system without the need to make any hardware or onsite upgrades through Remote Key Loading. A facility shall be provided to upgrade keys through the network and to change keys periodically, or when keys are compromised.
102. The SCH shall allow the ASCL/ACTSL to manually transfer security keys and certificates to other Bidders or Operators through the CCHS network. Hardware Security Module (HSM) shall be provided that securely manages the encryption and transmission of data. All secured data and algorithms shall be kept securely
103. The Key Management System shall preferably comprise a standalone subsystem located within a physically secured area. The MSI shall submit a detailed Key Management Strategy proposal for the ASCL/ACTSL's approval during the design phase. The initialization of all new SAM chips shall be done securely before they are deployed to the Contactless Smart Card equipment.

**104. Secure Access Module (SAM) management: Shall be provided by Financial Institution appointed by ASCL/ACTSL**

105. The Secure Access Module is a cryptographic smart media that provides security protection functions, such as authentication and cryptogram for transaction. The security keys shall be stored within this SAM. External applications shall have no direct access to the keys thus effectively protecting the system integrity. The transfer of the keys shall be by



SAM(s) whereby the recipient shall load the SAM(s) in its own key management facility for downloading or transfer of keys within its network of computers and equipment.

106. The ASCL/ACTSL shall be furnished with sufficient documentation and information to independently guide future bidders or operators in interfacing with the SAM. When introducing a new bidder or service provider to the system, the CHS Security Manager shall be able to generate new development key sets for their software development works, and transfer the key set to the service provider or bidder in a SAM via SCH. To interface with the development SAM, the developer shall be required to obtain a development SAM Authentication Key from the SCH.

107. **Equipment Management**

The SCH shall provide equipment management functions which shall allow the ASCL/ACTSL to define new equipment types and new owners for the system. The SCH shall manage and initialize all equipment and associated Secure Access Modules. Equipment shall be configurable in accordance with any one of the following categories:

- a. Add and Deduct Value;
- b. Deduct Value only;
- c. Read only;
- d. Initialization.

The SCH shall be able to support the current key files and be able to create new ones without any software modification.

108. **Media Related Functions**

The SCH shall make provisions for interoperability which shall include, as a minimum the following:

- a. Contactless Smart Media data structure provided shall permit other transit Service Providers to process the Contactless Smart Media for transactions with a common transit purse;
- b. Contactless Smart Media data structure shall permits other non-transit Service Providers to process the Contactless Smart Media for e-purse transactions;
- c. Provisions to facilitate the issue of Contactless Smart Media from off-site locations;
- d. Provisions to implement fare promotion and loyalty schemes for multi-mode transit and other common uses of Contactless Smart Media.

109. **Smart Media Tracking Management**

- a. The SCH shall contain the master database of smart cards and other media as applicable.
- b. Each individual Smart Media shall have a unique identity and shall be tracked from its initialization till its termination.
- c. On termination the unique identity shall be purged automatically from the database.
- d. The SCH shall create the master record upon initialization and shall update the status of the Smart Media including the purse value and status and other information using transactions that is uploaded to it.
- e. Amongst other data, the remaining trips, transaction sequence number, last date and time used, etc. shall be updated.

- f. Upon expiry or refund of the Smart Media, the record shall be purged taking into account the period allowed for refund for expired Smart Medias and the archiving period to meet any government or other regulations.
- g. Full details of the data fields to be included in the database needed to support the system shall be defined during the design stage and approved by the ASCL/ACTSL.
- h. The system shall also be designed to reflect the latest status of the Smart Media bearing in mind that transactions received by the SCH/ may not be in chronological order.
- i. The SCH shall also support the current Smart Media replacement In accordance with the Business Rules.
- j. A new Smart Media shall be reconstructed from data obtained from the SCH to replace the defective, lost or stolen Smart Media.
- k. This replacement facility shall be available at the SCH site, POS locations etc.
- l. The SCH shall also detect anomalies in the use of Contactless Smart Media.
- m. The Bidder shall propose the full and complete anomaly checks during the design stage for the ASCL/ACTSL's approval.
- n. The SCH shall manage the removal of retired Smart Media records after the remaining value in each Smart Media has been accounted for during expiry as revenue.

**110. Media Stock Management**

- a. The SCH shall be equipped with a stock management utility which shall enable the AMC to track Contactless Smart Media stock movements in the system covering the lifecycle of the Contactless Smart Media commencing from the date of purchase from the supplier until the time that the Smart Media has been removed from the system.
- b. The SCH shall also track returned Contactless Smart Medias due to refund, corruption, replacement, etc. and disposal.
- c. The SCH shall allow users to input to the system information when introducing new media to the system, editing information of existing media in the system, viewing information of existing media and removing retired media from the system.
- d. The SCH shall allow the ASCL/ACTSL to configure new media types to the system without changes to the application software.
- e. The SCH shall also allow useful information such as Smart Media vendor, issuer, batch number, date and time, etc. to be tracked in the system.
- f. The SCH shall actively monitor and update its stock information categorized by location (e.g. POS ID, etc.) according to the usage transactions such as initialization, issue, replacement, etc. and physical stock replenishment.
- g. Upon expiry of media, the SCH shall also adjust the stock management information accordingly.
- h. The SCH System shall include the following, as a minimum:
  - Total un-initialized stock of each media type;
  - Total initialized stock of each media type at each station;

- Total issued for each media type;
  - Total retired from use for each media type.
  - i. The SCH shall provide reports that shall provide immediate information on any discrepancies in the stock accounting figures.
  - j. The MSI may propose in its bid submission other means of tracking the media stock that achieves equivalent results and shall provide detailed descriptions of their proposed Media Stock Management.
111. **Smart Card Host Data Base Management: Shall be provided by FI appointed by ASCL/ACTSL**
- a. The Host shall maintain database of Cards, Cardholder, Audited and Unaudited Transactions data base as in a typical smart card host.
  - b. From the Card Initialization System, unique serial number and initialized date of every card shall be sent to the AFC Card Issuer Host, which stores the data in the Card Database.
  - c. Upon card issuance, the card shall be loaded with cardholder information, e.g. cardholder name, gender, age, which shall be submitted to the Card Database in the AFC Card Issuer Host. The Card Database shall transfer the cardholder information into the Cardholder Database.
  - d. Transactions from the frontend terminals shall be submitted to the AFC Acquirer Host. The records shall first be collected and stored in the Unaudited Card Transaction Database. After the card balance audit process, the transactions with no issue shall be stored in the Audited Card Transaction Database which links with the Card Database. Those exception transactions shall be put in the exception handling in the Unaudited Card Transaction Database. Investigation by operator/issuer shall be needed.

#### **6.7.2.2.10. AFCS Transaction Requirements**

1. Smart cards shall be recharged at the Bus Terminals and remote point of sale terminals. Bar-coded tickets / QR can be purchased at bus terminals POS counters and on the buses with on board conductors (using HTT).
2. Smart card shall be used as entry (origin) and exit (destination) and depending on the entry and exit the fare shall be deducted from the smart card account. At the time of entry, the smart card account should have minimum balance for commuting longest journey. In case the smart card account does not have appropriate balance, the entry should not be allowed and the user may get the recharge done at the POS terminals allocated on the station/terminal or through online mechanism.
3. At the time of entering destination station the smart card balance shall be checked by the system and if the account does not have sufficient balance, the commuter is required to pay cash and purchase paper ticket.
4. All journey types shall be time stamped which shall be configurable from central application. The business rules related to time stamping and fare benefit shall be user configurable and

the same shall be finalized and developed based on approval from ASCL/ACTSL after award of Contract.

5. The AFCS system shall support all business rules presently followed by city bus operations. In addition, if ASCL/ACTSL wants to add additional business rules into the system the same shall be provided to the MSI during system design stage. Transaction data shall be updated in real time (within 5 seconds) to/ from Central System from/to all the transaction points (terminal POS, handheld machines). Transaction data shall be updated in real time (instantaneously – within 1 second) to/ from devices located at same closed station. Multiple Tap-in, for a given smart card, at the same terminal or on-board shall not be allowed. There shall be a pass-back restriction with a configurable duration.

#### **6.7.2.2.11. Central fare management System - Operational Requirements**

The central fare management system shall offer ability to manage transit systems in an integrated manner. The system shall have ability to manage fare integration, central policy and products management etc. The system shall offer following operational capability to deliver project objectives:

1. The central system shall have ability to synchronise date-time of all computing assets.
2. The central computer system shall manage all device and their logs including:
  - Data storage and processing
  - Financial systems
  - User databases
  - Sales and transaction
3. All equipment shall operate with a real-time data connection to the central system via appropriate communications network.
4. If the data connection to the central system is temporarily not available, equipment's shall switch to an offline mode in which all data is temporarily stored in internal memory and transmitted to the central system as soon as the data connection is re-established.
5. The central software shall support managing fare tables and payment processes.
6. It shall be possible to "future-date" pending fare tables so that they can be uploaded ahead of- time and automatically activated at the planned date and time.
7. All handheld ticketing machines shall store the current valid fare-set as well as a future "pending" fare-set with activation date and time in order to allow downloads to the device to occur in advance.
8. When the activation date and time passes, the handheld ticketing device shall automatically replace the existing fare table with the "pending" fare table.
9. Updated fare-sets shall be downloaded as soon as the central system publishes notice that they have become available.
10. The central software shall be capable of providing over-the-air fare table updates & firmware updates to the handheld ticketing devices apart from other immediate critical updates.

11. Uploaded data shall not be deleted from readers or workstations until the central system has provided confirmation that the transactions have been successfully received.
12. The systems should be driven by configurable parameters and should provide the flexibility for maximum configuration. Some of configurations are:
  - Time based Fare table, Schedule, Routes, etc.;
  - User Groups and user's privileges;
  - Time validity of ticket;
  - Time validity of smart card entry;
  - Penalties associated with the smart card misuse;
  - Penalties associated with the short ticket;
  - Administration fee for issuance of smart cards, replenishment, replacement under defect, lost card replacement, smart card returns.;
  - Minimum balance required in smart card to make a trip;
  - Pass back time on smart card use;
  - Smart card policies;
  - Addition & deletion of equipment's, stations, routes, handhelds, user;
  - groups, users;
  - Reports access;
13. The system shall handle exceptions to ensure, while they are trapped, recorded for further processing, the system offers resolution to such events:
  - Smart Card not being read
  - Bar-coded / QR paper ticket not being read
  - Short ticket
  - Low balance on smart cards
  - Bar-coded paper ticket lost
  - Bar-coded paper ticket not readable after entry
  - Smart card lost after entry
  - Smart card damaged after entry
  - Any exception in the normal process shall be flagged separately for auditing and reports should reflect this condition. Mechanisms should be provided to help audit such exceptions.
14. The system shall handle conditions which can be, but are not limited to, the following:
  - Power failures
  - Data Connection lost
  - Central Server down

- Terminal POS system not functioning
  - Service delivery point POS not working / functioning
15. Alternative mechanisms and all required systems shall be provided for the AFCS in case system is in degraded state as specified but not limited to the above by the Bidder.
  16. There shall be back-up HTT capable of performing all the functions of the Terminal POS in all the bus terminals if the POS system is not operational for some reason.
  17. There shall be provision for data transfer from the back-up hand-held ETM machines to the central system once the system is “UP” and running. In no case there should be any duplicity and missing transactions/data in the central database.
  18. The MSI should provide an automated Fault Monitoring Module to generate reports identifying the faults of the equipment if any on a daily basis. The fault monitoring system shall have as a minimum the following capabilities:
    - Setting up of automatic and manual alerts
    - Automatic fault detection & reporting
    - Fault Status reports
    - Fault Closure reports
  19. These reports shall be non-editable and ASCL/ACTSL and/or its representatives shall have real time access to the Fault Monitoring Module with user privileges of the highest level.
  20. Automatic Backup/Archiving Software shall provide automatic back-up for the entire database shall be provided. The software shall allow taking complete back up or incremental back as per the desired archival policy.

#### **6.7.2.2.12. POS cash Management Requirements**

1. The AFCS system shall determine the expected amount collected from sales at the end of each shift of the AFCS operations personnel.
2. The AFCS system shall have shift end features to facilitate POS operator/conductor revenue collection reconciliation.
3. There shall be a module to report the excess or shortage after the deposit is made on a daily basis and the reasons for this shall be registered in the system.
4. The AFCS reports and the exception reports shall be useful in reconciling the operator/conductor deposits.

#### **6.7.2.2.13. AFCS Devices Maintenance Mode**

1. The central system and all the equipment shall support maintenance mode during repair, replacement and testing of equipment.
2. All transactions done during the maintenance mode on a handheld ticketing terminal shall be possible only using a special maintenance smart card issued specifically for the purpose.
3. All such maintenance fare media shall be deposited with the authorised persons within transit system.

4. All transactions carried out in the maintenance mode shall be reported separately similar to exception transactions.
5. The maintenance mode shall be possible only by using a dedicated maintenance “user privilege login” specially created for this purpose.

#### **6.7.2.2.14. AFCS Data Requirements**

1. ASCL/ACTSL shall own all system data and be able to use the central system to export transactions data for processing/analysis using office productivity tools or other data manipulation tools.
2. Data shall be retained in the database for at least the financial year previous to the current financial year.
3. All data shall be automatically backed-up daily without human intervention, using the backup devices and media.
4. Means shall be provided to automatically archive data (ASCL/ACTSL and MSI shall decide the timelines)
5. The transactional database shall store the date/ time stamped details of each transaction including all information transmitted to the central system from the system devices.
6. In addition to transaction records, the database shall incorporate additional records as following:
  - Device locations
  - Conductor and POS operator logins and logouts
  - Diagnostic/ maintenance data
  - Exception data

#### **6.7.2.2.15. AFCS Integration Requirements**

ASCL/ACTSL shall utilize AFCS and other payments data for integration with other sub-systems for the purpose of operational use by authority. The data from CCPS shall be required to be shared with other sub-system (AVLS/Intelligent Transit Management System or other sub-systems) and the data from other sub-systems may need to be automatically updated into AFCS and other systems as part of CCPS (like new user login, route details, fare details, bus-stops addition, etc. from AVLS / Intelligent Transit Management System or other sub-systems).

1. Predefined and agreed data shall be shared between two sub-systems, AFCS and AVLS/ITMS etc. and can be exchanged using appropriate formats.
2. The structure of exchange files / data can be agreed upon in a pre-defined format;
3. The encryption/Decryption details shall be provided to ASCL/ACTSL for data integration requirements.
4. The process of data sharing can be scheduled to run at pre-defined or need-basis intervals.
5. The required data exchange formats, data fields and inter-linkages shall be discussed in detail with ASCL/ACTSL during design stage and shall be incorporated accordingly.

#### **6.7.2.2.16. Data Storage**

The database system shall satisfy the following requirements:

1. Full-function RDBMS and other file systems (adequate to process) to Support complicated data structure shall be deployed, multi-user, multiprocessing, large capacity operation, offer data integration, data recovery and security, Support parallel processing, Provide disk mirroring functions, Authority control shall be independent of that of the operating system and Offer multilevel security management of database.
2. Data storage capacity shall be sufficient to maintain six months' transaction data available on line for ad hoc report generation and other investigations. The volume of data to be estimated by bidder.
3. To maximise the utilization of the disk space of the system, system data shall undergo a regular housekeeping process. Housekeeping shall cover the files created by the CCS and the files relative to each subsystem. Any outdated or invalid files shall be archived. Duplicated records in the database and records where only the latest data need to be retained shall be merged and archived.
4. The system shall be able to backup and recover data according to different modes and periods of backup required based on their criticality and data volume. The system shall have the functionality to backup and recover all key data (usage data, system data) and files.

#### **6.7.2.2.17. CCS Security**

1. Access security shall be implemented for Central Control System including data center to manage authorized and authenticated movements only. The MSI shall be required to install biometric and card based system to secure operations center.
2. The system shall only be accessible by authorized persons, controlled using login and password protection. It shall be possible to create different user groups with different privileges. The system shall maintain a transaction log that records all users that access reports, the reports accessed, edits and changes to the database and the system log-on and log-off times. The transaction log shall maintain this information for a minimum of one year. Editing of data in the log shall not be possible for any user. Further non editable, tamper proof, mirror copies of logs should be sent to the ASCL/ACTSL periodically. The system security shall provide features to maintain data integrity, including error checking, error monitoring, error handling and encryption. Verification features shall be provided to ensure that all system-created files are uniquely identified, and that no files are lost or missed during data transfer. All systems, sub-systems and devices shall only allow access to authorized user group. All security breach detections shall be confidential, and accessible only to users of the appropriate group. For all data transactions, the system security shall include authentication features to verify that all claimed source, recipient or user identities are correct and valid. All data transactions shall include non-repudiation features to verify message content that data was not correctly originated or received by a certain user. Device-



to-Smart Card communication shall be secured using multiple security keys and layers of information protection or encryption to mitigate risk against the possibility of being “hacked” or read by an unauthorized device. MSI shall also provide information on proposed security methods in their Proposal submission.

**6.7.2.2.18. Clock Management**

1. The Central Control System shall obtain the standard date and time and synchronize its clock automatically from ASCL/ACTSL or its designated master clock system. The CCS shall synchronize its clock at least once every 15 minutes. If the clock is not synchronous to the standard time, the correction shall be completed in one second.
2. The clock information shall be downloaded to all equipment's. When the clock time of a device is different to the downloaded clock time, the device's clock shall be corrected automatically to the downloaded clock time. The correction shall not happen with the trip of a bus to avoid incomplete transactions due to time variation.

**6.7.2.2.19. Reports**

1. The system as a minimum shall be delivered with capability to generate following reports, a comprehensive list of reports further than the mentioned below shall be finalized at the time of requirement finalization stage:
  - a. Conductor / Driver Login reports for Day, week, month
  - b. Non Compliance issues of different driver / conductors for the shift
  - c. Trip summary.
  - d. Bus Equipment Fault Summary
  - e. Hourly Bus Usage Summary
  - f. Total Commuters and revenue per Route, per Bus, per shift
  - g. Revenues collected on same bus, same route, same trips by different Conductors
  - h. ROI route wise, trip wise, shift wise
  - i. Passengers boarding bus at a Bus stop – Time of day
  - j. Daily pass usage and its ROI for the passes validated
  - k. Student pass usage and the Cost of the subsidy that has to be refunded by Government- daily, weekly, monthly, yearly.
  - l. Origin – Destination

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- m. SC Bus Usage by Route Number
- n. Test Card Usage by route Number
- o. ASCL/ACTSL employee's usage of services
- p. Bus Service Disruption
- q. En-route Ticket Inspector Summary
- r. Boarding and Alighting Service
- s. Boarding and Alighting statistics
- t. Passenger KMS analysis per trip configurable by the user
- u. Bus Rides and Revenue Statistics by Fare Code
- v. Bus Equipment Transactions
- w. Bus Faults Per Transactions Processed by Device
- x. Cash Revenues as per ASCL/ACTSL MIS
- y. Smart Cards not used for the week, Month
- z. Bus Equipment Fault Summary
- aa. Half-Hourly Bus Usage Summary
- bb. Total Patronage
- cc. Bus Patronage and Revenue Statistics by Service Number
- dd. Bus Service Revenue and Passenger Statistics Summary
- ee. Boarding Ride Bus Stop
- ff. Summary of Bus Passengers Boarding by Service Number
- gg. System, Depot, Devices, STT CD parameters set current and pending future CD sets
- hh. Transfer Statistics
- ii. Bill payments category wise
- jj. Location wise statistics
- kk. Revenue collection and settlement merchant and location wise

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2. Any portion of the transactional database shall be exportable in standard formats (such as .CSV, .XLS, .XLSX files etc.) for analysis in third party programs.
3. It shall be possible for users to build custom reports from the data in the transactional database.
4. The reports shall be exportable to .pdf, .XLS, .XLSX formats easily.
5. A data dictionary shall be provided to ASCL/ACTSL to facilitate development of custom reports.
6. The Central System shall provide sufficient summarized and detailed data including features to generate standard report based on pre-established criteria, as well as required reports based on a user-definable set of search criteria.
7. Reporting software shall include the ability to generate graphs and charts based on criteria and format defined by the user.
8. The CCPS system shall be capable of generating detailed reports as desired by ASCL/ACTSL, for any/ all the transactions with filtering capabilities w.r.t route number, ETM ID, Conductor ID, Bus registration number, Operator name, time duration, shift id etc.
9. All reports shall be generated with configurable time parameters, including as a minimum annual, monthly, weekly, daily, hourly and with user defined start-end date and time ranges
10. As a minimum, the Central System shall generate the following standard System reports daily, weekly, monthly, quarterly and annually. The details of report contents shall be determined in conjunction with Purchaser during the Design phase after contract award.
  - a. Passenger trip reports;
  - b. Passenger fare reports;
  - c. Daily ridership reports;
  - d. Monthly summary ridership reports broken down by passenger type (Adult, Child, Senior);
  - e. Fare media in use summaries;
  - f. General daily, weekly, monthly, and year to date revenue reports;
  - g. Pass sale and reload summaries;
  - h. Monthly fare underpayment summaries;
  - i. Sales by date/time, fare media type, amount, location, and other parameters
  - j. Use by date/time, fare media type, location, and other parameters
  - k. Inventory reports by fare media type
  - l. Fraudulent activity reports by fare media type

- m. Financial reconciliation and settlement reports
  - n. Non-sufficient-funds and other financial reports
  - o. Transaction reports by location by fare media type
  - p. Fare media replacements, adjustments, or refunds by fare media type
  - q. Unused/remaining smart card value
  - r. Faults and errors
  - s. Issued smart card reports
  - t. Blocked smart card reports
  - u. System exceptions reports; and
  - v. System performance and activity reports
  - w. CCPS Operator activity report
11. The MSI shall provide an ad-hoc reporting function, and interface into the data and reports server, to allow ASCL/ACTSL personnel to create, execute and receive custom reports without bidder's assistance. A web-based interface shall be provided for this function, accessible by ASCL/ACTSL's personnel with appropriate permissions. ASCL/ACTSL users shall be able to generate ad-hoc reports and do additional analysis of ridership, revenue and other system data. Examples of the types of reports include: Transaction-level reports by stop and for user-defined start and end points; Statistical and research reports using user-defined criteria.
12. It shall be possible to aggregate data (filter) for reporting, at a minimum, by:
- a. Date/Time
  - b. Ticket Origin
  - c. Ticket Destination
  - d. Fare Media Type
  - e. Location
  - f. Smart card Serial Number
13. It shall be possible to configure in the system such that certain report types to be pushed automatically to a given e-mail address after regular intervals (configurable few minutes to few days).
14. The above state reports are only indicative, actual list could be exhaustive based on ASCL/ACTSL's requirements.

15. The MSI shall provide ASCL/ACTSL a GRAPHICAL DASHBOARD to have visual view of all / some key reports/ parameters enabling quick decision making.

#### **6.7.2.3. Point of Sale**

1. Point of Sale operators at terminals shall be able to issue bar-coded paper tickets and recharge smart card accounts using a Point of Sale System.
2. A terminal POS shall have following accessories as a minimum:
  - a. Smart Card Management device
  - b. Bar-coded paper ticket Printer
  - c. Barcode Reader
  - d. Display system for the user
  - e. Spare ETM as backup during degraded operations only
3. Before starting operation, a POS operator shall manually enter an employee ID and a Password to login into the system.
4. The POS should provide biometric based login system for POS operator to login into the system.
5. Logins and logouts shall be transmitted to the central system, along with associated Date/Time, employee ID, POS ID etc.
6. The POS system shall log-off the current operator if the system is idle for more than 10 minutes (configurable).
7. To sell a bar-coded paper ticket the operator shall, upon receiving payment, enter the destination using the interface (the origin shall automatically be set based on the location of the POS device at that station) and print the paper ticket.
8. Upon successful completion of the transaction the POS system shall transmit purchase transaction data to the central system, including:
  - a. Date and Time of Transaction
  - b. Device Identification Number
  - c. Transaction Serial Number
  - d. Transaction Origin
  - e. Transaction Destination
  - f. Fare collected
9. The interface shall be such that an experienced POS Operator can complete the process of issuing a bar-coded paper ticket in less than 5 seconds with the details updated in the central system within the next 5 seconds from transaction completion.
10. A customer shall be able to check the balance on the smart card by giving his card to the
11. POS operator or tapping the smart card against balance checker terminal located at each station and terminal or using online webpage after entering the card details.
12. The barcode printed on the paper tickets should be readable by the fare validators installed at all the terminals.

13. Desktop mounted omnidirectional barcode readers shall be provided with each POS terminal to read the barcode tickets in case required for reissuing, verification, cancellation or other transaction related purposes.
14. For any paper ticket trip, the validated ticket at the entry fare validator should allow the passenger to exit at all stations up to where that fare value present in the paper ticket is sufficient.
15. Bar-coded Paper Tickets shall have following information printed on the ticket to manually verify the journey details. In addition, the same information shall be encrypted and printed in the form of barcode to automatically authenticate the same when read by a barcode reader:
  - a. Unique Ticket Serial Number
  - b. Origin Station
  - c. Destination Station
  - d. Trip fare value
  - e. Date, Time of purchase of ticket, route information if applicable
  - f. Operator/Issuer ID
  - g. Directional information
16. Upon reading the ticket at the entry, the validity shall be checked.
17. If the ticket is valid, an auditory and visual indication shall be provided
18. If the ticket is not valid, an auditory and visual indication (distinct from those for valid) shall be provided
19. Security features shall be used in the machine readable tickets to prevent fraud and revenue leakage, such that it shall not be possible to counterfeit the ticket.

#### **6.7.2.4. Electronic Ticketing Machines (ETM)**

1. The Electronic Ticketing Machine (ETM) should facilitate the following tasks:
  - a. Bar-coded paper ticket Sales
  - b. Bar-coded paper ticket Adjustment
  - c. Smart Card Validation
  - d. Smart Card Balance Check
2. The ETM's shall be connected to the central system through mobile connection and the MSI shall bear all cost for such connection during the entire contract period.
3. The handheld machine shall consist of but not limited to smart card reader, bar-coded ticket printer, integrated communication modem, user interface (e.g. touch screen or screen with keypad), on board data storage, and battery power supply.
4. The user interface shall allow an experienced conductor to issue a ticket in less than four (4) seconds.
5. The handheld machine shall allow ASCL/ACTSL to transmit data to the central system in real-time using the integrated modem.
6. The handheld machine shall have an integrated display that can be easily read under all conditions of ambient light throughout the day and night.

7. It shall be possible to upgrade the firmware/software from the central server, configuration list such as routes along with fare and other related details etc., data from and to the CCS Over-The-Air (OTA) using the wireless technology.
8. If for any reason the fare media cannot be read automatically using the readers on the handheld, there shall be an arrangement to manually enter the smart card ID and validate it.
9. The handheld machine shall store all required transaction data on-board, including:
  - a. Date and time of transaction
  - b. Device ID
  - c. Employee ID of conductor
  - d. Fare-tables
  - e. Ticket serial number
  - f. Ticket origin
  - g. Ticket destination
  - h. Transaction Value
  - i. Action taken (e.g. ticket sold/adjusted/checked)
  - j. Smart card serial number (if applicable)
  - k. Transmission Status (i.e. successfully transmitted/not successfully transmitted)
10. The handheld machine shall have sufficient memory to store a minimum of one-week worth of transaction records apart from mandatory software/ firmware etc.
11. Only successfully transmitted transaction data records shall be overwritten by new transaction data records.
12. The handheld machine shall provide a warning when the amount of on-board storage occupied by “not successfully transmitted” transaction data records exceeds ASCL/ACTSL specified threshold.
13. The handheld machine shall store the current valid fare-set as well as a future “pending” fare set with activation date and time (if applicable), to allow downloads to the handheld machine to occur in advance.
14. When the activation date and time passes, the revaluing unit shall automatically replace the existing fare table with the “pending” fare table.
15. Initiate handheld machine operation, a conductor shall manually enter an employee ID and a PIN, or a proximity standard.
16. Logins and logouts shall be transmitted to the central system, along with associated Date/ Time and employee ID.
17. The handheld machine shall be used by mobile ticket conductors to sell tickets to customers.
18. The tickets issued shall comply with all requirements laid out in the relevant sections.
19. The conductor shall be able to manually adjust the current origin location.
20. The origin shall be set only once whenever it is changed so that the conductor needs to enter only the destination of people until the next origin is reached.
21. To sell a ticket using the handheld machine the conductor shall, upon receiving payment, enter the destination using the interface (using the current origin which is periodically adjusted manually by the conductor).
22. The handheld machine shall then print the ticket for issuance to the passenger.

23. The system shall provide the ability to add a configurable fine (either optional or mandatory for use by the conductor) to a ticket by pressing the appropriate buttons on the handheld machine interface (for example, if a new ticket must be issued because a customer does not have a ticket or has an expired ticket).
24. The handheld machine shall have a trip validation functionality whereby when a smart card is tapped to the reader, the ticket origin and date/time of the tap-in is displayed on the handheld device display.
25. Upon successful completion of the transaction the handheld machine shall transmit transaction data to the central system, including:
  - a. Date and Time of Transaction
  - b. Device Identification Number
  - c. Ticket Serial Number
  - d. Ticket Origin
  - e. Ticket Destination
  - f. Smart Card Serial Number
26. Upon successful completion of the transaction the handheld machine shall indicate successful completion via the interface, using both the display and a distinct configurable audio message.
27. The device shall have balance check functionality whereby when a smart card is tapped to the reader, the smart card stored balance, any outstanding trip details, status of the smart card are displayed on the handheld machine display.

#### **6.7.2.5. Smart Card Management**

1. To support customer service, it shall be possible for ASCL/ACTSL to view the following information for each smart card:
  - a. Passenger name (wherever available)
  - b. Smart Card Serial Number
  - c. Smart card issue date and time
  - d. Fare payment transaction history
  - e. Revaluing transactions history
  - f. Trip history for at least 24 months
  - g. Stored value balance
  - h. Currently trip details (if applicable)
  - i. If smart card is blocked, reason for blockage (e.g. user reported lost/stolen, expired)
  - j. If the smart card is a pass, in addition to the above the following have to be satisfied:
    - k. Type of pass (if applicable)
    - l. Address (in case of pass)
    - m. Personal details of the passenger ( in case of pass)



- n. Photograph (in case of pass) Scanned proofs and supporting documents (in case of pass)
- 2. Smart card recharge can be done using devices at the Point of Sale location / service delivery points as well as the Point of Sale Workstation for Smart Card Personalization.
- 3. The station POS shall have an interface visible to both POS Operator and customer, to allow entry of the amount of stored value to be added to the smart card and incorporating an integrated display and data entry/selection mechanism.
- 4. The POS equipment shall indicate when a revaluing transaction has not been completed successfully for a potentially transitory reason. Indication shall be via the interface, using both the display providing a brief message instructing the customer to retry the transaction, and a distinct configurable audio message. Potential reasons for this condition could include
  - a. smart card not correctly placed in the revaluing device field or removed from the field too quickly,
  - b. multiple smart card present, simultaneously in the revaluing device field,
  - c. Loss of connection/incomplete transmission of data between device and the central system, error response from the central system, and media not successfully read etc.
- 5. The POS equipment shall indicate when a revaluing transaction has not been completed successfully due to the smart card being blocked. Indication shall be via the interface, using both the display providing a brief descriptive message and a distinct configurable audio message.
- 6. The interface shall be such that an experienced POS Operator can complete the entire process of revaluing smart cards in less than 5 seconds and the transaction updated to the central system within 6 seconds.
- 7. The POS equipment shall transmit the following transaction details when performing a smartcard revaluing transaction:
  - a. Date and Time of Transaction
  - b. Device Identification Number
  - c. Smart Card Serial Number
  - d. Value Added
- 8. Smart card contents at end of transaction (e.g. stored value balance)
- 9. The revaluing device shall confirm when a revaluing transaction has been completed successfully via the interface, using both the display and a distinct configurable audio message.
- 10. The time to complete a transaction, measured from the time that the customer presents the smart media until the time that the revaluing device confirms a successful transaction (or indicates a transaction not completed successfully), shall not be longer than one second.
- 11. The revaluing device shall have functionality to check and display to customers the balance on their smart card.
- 12. The central system shall reconcile stored value loaded on smart cards with the revaluing transactions and use transactions for the same smart cards, and shall identify cards that appear to have stored value that was not paid for.

13. The central software shall support the ability to block individual smart cards from use with the system.
14. The blocked card list shall be maintained on each system device that includes a smart card revaluing device.
15. Blocked card list updates (to add or remove cards from the blocked card list) shall be updated to all applicable system devices within 15 minute intervals.
16. It shall be possible to block multiple or series of smart cards based on serial numbers.
17. It shall be possible to un-block/restore a smart card.
18. Synchronizing with bank card host system

#### **6.7.2.6. Pole Mounted Fare Validator**

1. Pole Mounted Fare validator's primary function is to validate fare media and allow access to service. The device has capability to read / write to smart cards and read QR code based tickets.
2. Standards: Terminals that shall be provided by the bidder shall comply, as a minimum, with the following additional requirements:
  - a. Proven in service; Compliant with, and certified to, established industry standards including EMV, ISO 14443, ISO 7816, ISO 18092, ISO 10373-6 and EN 1545
  - b. Compliant with all PCI norms
  - c. The terminal shall hold at least 3 SAM slots.
  - d. Manufactured from non-corrosive, non-toxic materials which are chemical resistant;
  - e. Reliable, weatherproof and durable to meet transit & mass transit application needs.
3. The terminals shall also be capable of reading Visa/MasterCard/RuPay cards in a contactless environment. The terminals shall also be capable of performing script processing. (For e.g. Payments made over the internet would be transmitted to the terminals and the terminals shall be able to update the balances on the card once the card is used on the terminals. The terminal file shall remove such balance update entry once the card is updated with the top-up amount)
4. Communications between fare media and the Fare Validator shall include for the following:
  - a. Anti-collision mechanisms in accordance with ISO 14443 and 18092, to establish an order of communications on detection of a number of contactless smart media in the field of view of the reader;
  - b. High level of data integrity to eliminate transmission errors, employing mechanisms such as Message Authentication Code (MAC) for data transfer;
  - c. Capable of performing symmetric and asymmetric cryptography
  - d. For electrical and mechanical parameters certification from ARSENAL /Equivalent is required.
5. Shall support contactless applications
  - a. MasterCard PayPass
  - b. Visa payWave
  - c. Interac Flash

- d. Rupay
- e. ISIS
- 6. Should have large capacity memory to store at least 7 days of transaction data.
- 7. **Contactless Card Reader:** 13.56MHz, ISO14443 Type A/B, Mifare®, Ultralight 'C'; DesFire, EMV/Rupay, NFC, 4 RF Indicators
- 8. **Card Slots:** Atleast 3 SAM Slots, ISO7816
- 9. **Peripheral Ports:** 1 x RS232 or 1 x USB
- 10. **Buzzer:** 95dB or better
- 11. **Environmental:** As per Allahabad city requirements
- 12. **External power supply:** As per design
- 13. **Physical Reader:** Should be compact size as per design
- 14. **Certifications:** MasterCard PayPass, Visa payWave, Rupay, Discover Zip, Interac Flash, ISIS, EMV Contactless L1
- 15. **Operating System:** Windows / Linux / Android (4.2 or above)

#### **6.7.2.7. Passenger Information System**

Passenger Information System hardware shall consist of LED based display system for bus shelters, Terminals and Buses. Following are the technical specifications for the display units. The passenger information system shall comprise of following components:

- a. Display Screen on Bus Shelters
- b. Display Screen on Bus
- c. Voice announcement system on Bus
- d. Web Portal for Bus route Schedule &ETA
- e. Mobile Schedule Access System

##### **6.7.2.7.1. PIS at Bus Shelters and terminals**

LED based display screens that provide sufficient visibility in broad daylight condition shall be installed at Bus Shelters & Terminals. There shall be two displays per shelter. They shall display route and estimated arrival time (ETA) including digital advertisements and other digital content as may be approved by ASCL/ACTSL. They may also be used to display public service information.

The display shall receive encoded information of route and ETA from the AVLS control system through the common wired/wireless communication link set up at each bus shelter as part of the AFCS system. The displays must have the ability to decode the information received from CCS and display appropriate message on the screen. LED Board at Bus Shelters & Terminals shall have the following functional specifications:

- a. Display of PIS in a display unit at bus shelter shall be configurable based on bus shelter and platform. Single unit should display services of more than one platform.
- b. Information Display units shall be supplied and mounted appropriately, configured and commissioned by the MSI.

- c. PIS information shall be displayed in Hindi and English alternatively (single or multiple language shall be configurable).
- d. At all these bus shelters, display units shall receive/display transmitted contents from the central system through a gateway or mention other suitable means in the technical architecture.
- e. Display systems needs to support full colour display for streaming advertisements, Digital display of text, images and video on LED screens.
- f. Displayed messages must be readable in high bright, day light.
- g. Display system in addition to the display of information for PIS shall be capable of displaying advertisements and multimedia content at the bus shelters and may need to alternate between Passenger information and Advertisements.
- h. The frequency and period of information display on PIS display shall be configurable from central location for advertisements and other transit information.
- i. Display shall provide for modular configurable layout enabling parallel display of content on different areas of the screen – Real time Transit information (Routes, ETA, Type of service, Fare, Time/Date, Public announcements, Safety information, Commercial advertising, a ticker tape at the bottom for text announcements/advertisements, other local Tourist information).
- j. All displays for PIS shall have a configurable refresh rate with minimum of 10 seconds.

**6.7.2.7.2. Display System Technical Requirement (PIS)**

- a. Display units shall be mounted on a rugged enclosure to withstand harsh environmental conditions with reasonable physical security.
- b. Display shall be located at a convenient height to have a clear view of the message of next arrival bus.
- c. Fitment provision shall have to be provided in the Bus stations. The power supply shall be made available by ASCL/ACTSL.
- d. One Integrated tamper proof casing for complete PIS Unit addressing physical security considerations.
- e. Provide any hardware like PC, networking, etc. required to run the PIS and advertisements on LED Display Units.
- f. Ensure smooth transition from main power supply to UPS in case of power outage.
- g. Aesthetic requirements such as fonts, colours, rows per page, display time to be remotely configurable and displayed based on business requirement.

**6.7.2.7.3. PIS on bus**

Passenger information system on bus shall function as an independent system and shall not be directly dependent on the CCS. They shall receive display information and voice announcement commands from the onboard GPS vehicle control module based on stored memory on the bus.

Specifications of PIS units to be installed on bus: Refer Annexure 1: MOUD Urban Bus Specification II.

**Voice Announcement system on Bus:** The Voice PIS must play clearly audible pre-recorded voice announcements informing passengers of next bus station on route. The voice PIS shall interface with the on-bus GPS module to gather location information and making the appropriate next station announcement.

#### **6.7.2.7.4. Web Portal for Bus Schedule &ETA**

ASCL/ACTSL's transit web portal shall extend capabilities to passengers to download route information, route schedule and real-time ETA from the web portal. This information must be accessible using WAP enabled mobile phones also. The portal shall have facilities for pass application, card top-up using credit/debit cards. Etc.

The MSI shall also be required to develop mobile App for iOS, Android, Windows mobile devices to enable commuter to use the same for the purpose of travel information relating to service which may include, route planning, ETA, Offers, Fare and route tables etc.

The portal shall act as a single source of information with regards to transportation system in Allahabad city and hence shall have all possible interfaces like logging complaints, viewing transport information, real-time updates, organizational structure, citizen blogs etc.

The portal shall have sections which shall provide information related to travel advisories, camera still feeds and PIS locations mapped on GIS map with real-time data.

#### **6.7.2.8. Scheduling, Planning & Dispatch Management**

System should have capability and be used at public transport operator with bus operations exceeding 2500 buses.

The system should have ability to optimize the complete service delivery by developing the route network and publish final timetables & rosters, generate informative statistical summaries and MIS from the system, handle multiple vehicle type like AC buses, ordinary buses, long route buses etc.

Proposed Solution should have following integrated functionalities/tools from same OEM and should offer complete integration capability with other operations management system like AVLS, AFCS etc.

- Network Plan & Timetables
- Trips & Vehicle Planning
- Crew Schedules
- Roster and Dispatch (Operations)
- Crew Kiosks
- Performance monitoring
- Workshop & Fleet Management System
- Fuel Management
- Tyre Management
- Procurement & Inventory Management

- Capability to scan and upload documents like License, purchase order copy, etc. into corresponding sub systems and use this information for compliance purposes.

The proposed system shall provide feature for creating vehicles in one depot and process for transferring vehicles to other depots including features to capture trip/schedule wise revenue kilometer. The system shall also have following feature:

- Capability to capture dead kilometers in the solution.
- Define and create Charter trips into the system
- The charter trips should be reflected into the operation module for rostering and dispatch functions.
- Capture requirements from customer for chartered trips into the system.
- Make changes in routes and bus stop locations due to traffic management (traffic police) changes (one way streets, construction, etc.)
- Create users in the system
- Assign roles, access and user permission in the system
- Support user defined event definition for sending alerts and message
- Send alerts and email based on certain conditions/events/transaction.
- All modules/sub modules of Depot management should be seamlessly integrated
- Support in deriving efficient vehicle assignment by route minimal repositioning/dead runs
- Should have integrated Optimization Tool for vehicle and crew based on various constraints and preferences
- Generate “what-if” scenarios.
- Support drag and drop for network planner; undo and redo; search.
- labor award conditions and preferences
- Provides the costs associated with each service option
- Produce printouts of crew schedules, duty rosters, route timetables, bus stop timetables etc.
- Generate On-demand statistical reports and summaries
- Ability to generate Reports such as
  - Statistics Report - Headway, Running times for each trips.
  - Running Boards - Time table of each RUN
  - Arrive Depart Graph
  - Timetable reports - to be displayed at bus stops
- Import master data such as nodes details with its respective GIS data to the Map, Vehicle data etc.
- Additional reports as per request
- Provide facility to export data/reports to in pdf, excel /.csv /XML or HTML formats
- Perform trip time deviation analysis to find where the critical trips.
- Support for constraint analysis to find where the critical constraints are
- Save documents like birth certificates, education certificates, license, offer/ appointment order, etc.
- Solution should support following MIS Reporting

- Crew allocation
- Schedule allocation
- Crew utilization report
- Fleet departure at depot
- Fleet dead KM per route/ fleet wise
- Revenue kilometer
- Schedule or trip cancellation
- Crew license renewal history
- Over time details per staff wise
- Fuel stock per month/ week/ per day
- Fuel consumption every day
- Fleet wise fuel consumption
- Vehicle service alerts

#### **6.7.2.8.1. Network Plan & Timetable**

Proposed solution should be capable to interface with GIS Maps.

- Calculate distances between associated points defined as stop / terminus / depot on the GIS Maps.
- Network planner or map interface that allows the user to define stops, terminus and depots on the map
- Ability to link various nodes (stops, terminus etc.) with paths to create a graphical route network that is easy to understand.
- Create, edit and modify depots, stops and terminus in system
- Create routes and timetables for both inbound and outbound directions.
- Track and minimize dead runs
- Add/view Average Speed / Distance
- Add/modify/delete/undelete/view Vehicle Type.
- Create timetable, adding and modification of trips, assigning the vehicles to the trips thus creating a vehicle schedule.
- Construct crew schedules by integrating with the vehicle schedule.
- Create vehicle schedules with split into a set of shifts, allowing the split to occur only at the relief points, a place where a crew may handover the bus to another crew.
- Create a new route
- Edit an existing Route
- Add turn restrictions
- Remove Turn restrictions
- Enable / disable turn restriction
- Set to One-way
- Set to Two – way
- Set to Blocked Road
- Define Road Class - Main roads, highway, narrow road, freeway, toll road etc...

**Request for Proposal (RFP) for Selection of Master System Integrator (MSI) for Implementation of Integrated Command & Control Center (ICCC) in Allahabad City**

- Authorized user should be able to create Road speeds for various road types
- Authorized user should be able to add nodes / points. With identified with unique Id. as Bus stops, Bus terminus, Time points, Meal place, Depot, Relief points etc.
- Only Authorized User should be able to delete nodes / points.
- For each of the nodes / points added, user should be able to add name for public timetable.
  
- Add Longitude and Latitude coordinates for nodes / Points.
- Indicate type of shelter for a bus stop
- Capable to define vehicle types which can stop at this location, if it is a bus stop
- Ability to create and add multiple type of buses - single decker, double decker, mini bus, multi axle bus etc.
- Create a Path - user should be able to
- Define route/path with unique path ID / name for it
- Edit an existing path by choosing the path id / name
- Create Route/Path with repositioning/z-path, start point and end point with or without GIS MAP
- Adjust the route/path to consider the roads and shortest distance the bus has to perform the journey
- Copy and duplicate an existing path
- Add, remove or modify nodes on the path
- Create a multiple path with a combination of one or more paths
- Define inbound and outbound routes
- Ability to automatically create a reverse/return path with the same attributes and details as in the original path
- choose a Vehicle type or types for a particular path
- Allow an authorised user to delete a path or a multiple path
- Identify and edit Travel distance, Travel time based on GIS information and Average speed defined by user for the entire path / route or specific nodes/stops.
- Define and edit the speed for the entire path / route or specific nodes/stops
- Create on the MAP dead run path from a specific depot to any bus stop of a path
- Auto create dead run path from any of the depots to any bus stop of a path and what if analysis
- Define and Edit the speed, Travel time, Travel distance for the entire dead run path
- Allow user to combine a path and the dead run path to be part of an inbound/outbound route path
- Handle multiple depots and optimize schedule across depots
- Optimize fleet results against depot and vehicle constraints
- Ability to edit Running Times in
  - in table view
  - using graph
- The Fleet/vehicle module should support
  - Multiple day types – like Week Day, SAT, SUN, Holidays etc.



- Timetable - inbound and outbound paths
  - Add trips - inbound and outbound paths
- Ability to View trips by
  - Tabular Format
  - Graphical/Zig-zag view
  - Horizontal view
- Ability to define multiple day types for the entire calendar year or a specified period for weekdays, Public Holidays, School vacation, Saturdays, Sundays and any other combination of days (like 2nd Saturday) etc.
- Ability to define and link route/path to a specific day type time table - weekdays, Saturday, Sunday, Holiday etc.
- Map should feature's such as PAN, Zoom-in, Zoom-out etc.
- User should be able to print the below reports
  - Graphical report for a Path / Route
  - List of Nodes / points with the relevant details
  - Graphical report for a path / route with different travel times for different time periods in a day
  - Public Time Tables

#### **6.7.2.8.2. Trips & Vehicle Scheduling**

- Solution should have ability/edit specify inbound and/or outbound timetable for a specified day type.
- Allow user to define the path type for the time table - circular, loop, Radial etc.
- Add, edit and copy/duplicate timetables
- Only authorized users should be able add, edit or delete timetables
- Link/add trips to the selected timetable.
- Add trips automatically to the time table based on start time, end time, number of trips or headway
- Modify any / all trip running time, running distance, add new time points, truncate any of the trips and save the changes
- Allow user to join / unjoin the trips based on ending or starting within a time gap
- Join/unjoin trips in manual, assisted and auto mode.
- Allow user to split the trips in a time table
- Support multiple methods of viewing the trips, paths and nodes / bus stops and to switch instantaneously between the views.
- Add, edit, delete and copy/duplicate a Bus schedule for a day(s) in which buses have to operate trips as per the selected inbound and outbound timetable (s) and include a user defined name to it

- Allow an authorized user to add, edit, delete and copy/duplicate a bus schedule.
- Ability to link all the inbound and outbound trips in manual, assisted and auto mode.
- Ability to indicate the number of buses required to Operate all of the trips upon complete linking of all the trips.
- Ability to provide appropriate error messages in case layover times and Dead run timings do not match in the time tables.
- Solution should have ability to Minimize shifts
- Ability to Minimize mixed shifts
- Ability to Minimize costs
- Ability to minimize Total spread of hours of running
- Ability to Minimize number of continuous driving segments
- Solution should have ability to Avoid idle time of bus during AM peak, PM peak
- Ability to Minimize dead running KMS
- Solution should have ability to Minimize layover time at Depots, meal points/Relief points
- Ability to suggest minimum vehicle required for the schedule.
- Ability to Maximise or minimise the bus running hours
- Ability to display exceptions such as trip without any bus
- Ability to split, Join, Merge and Renumber RUNs
- Ability to duplicate RUNs
- Ability to colour code trips
- Ability to link /unlink buses to trips
- Ability to perform parallel scheduling of services such as trunk and feeder system, the schedule of the trunk bus and the feeder bus must be synchronized to the extent possible, to minimize the transfer waiting time for passengers. The system should allow for such synchronization and calculate automatically the trips of schedules of a route/multiple routes
- Ability to identify relief points where crew can interchange and have meals.
- Ability to pick and drop crew at relief points/depots as per the schedule.
- Solution should handle the schedule for these pick and drops using either fleet of vehicle dedicated for crews or public transport.
- Ability to provide multiple MIS and reports from the System, such as:
  - For Time table
  - by Path
  - by Route
  - by start time
  - by end time
  - by trip number
  - by day(s) of the week
  - by distance
  - by speed

- Bus Arrival and departure summary from a depot
- Bus RUN summary report with or without time points / bus stops for day(s) of the week with statistics data on Running KMS and time, Dead Running, Idle time, recovery / layover time,
- Number of buses operating in traffic from a depot spread over 24 hours

#### **6.7.2.8.3. Crew Schedules**

Solution should be capable of meeting the existing Rules of crew duties.

- Create crew schedules considering different shifts parameters such as shift spreads, meal time etc.
- Create crew scheduling as per the Motor Vehicle Act.
- Define relief points.
- Define shift start and end points
- Define relief points and duties with travel to these points by walk, bus, Metro or by staff bus.
- Ability to consider the different modes of transport and the time taken by each mode while creating crew schedules
- Ability to consider the travel time to relief points with multiple mode of travel In case relief points and shift start location is different locations.
- Ability to minimize the duty spread
- Ability to Minimize travel time from relief points to depot / meal locations
- Ability to minimize breaks between 2 blocks of service
- Ability to Schedule duties such that the last portion of duty shall close at a particular depot
- Ability to ensure minimum hours are worked before a meal break or an extra break
- Ability to ensure minimum hours are worked before an extra break
- Solution should be capable of creating crew schedules for Bus schedules which operate from a specific depot / group of depots or from all the Depots
- Capability to create crew schedule including/excluding certain Route Numbers
  
- Capability to create crew schedule considering a specific meal break location for a particular Route Number / selected route numbers
- Ability to view, edit or allocate crew to a schedule
- Ability to re-adjust Constraints / preferences rules for a depot or the entire depot and re-run the Crew schedules
- Solution should be accessible by all Depot authorized users to download the Crew schedules created by the system
- Solution shall enable the user to define rules, including:
  - Relief points (driver changeover points)
  - Vehicle depots
  - Meal places (may be a vehicle depot)
  - Modes of travel (e.g. walk, staff car, etc.) to and from relief points and depots

- Shift types that can operate a service, e.g. straight, broken or part-time
- Rules for legal schedules
- Ability for optimizer to number driver shifts in a user defined numbering pattern

#### **6.7.2.8.4. Reports from the System**

- Detailed Crew report for each duty / crew day(s) of the week clearly indicating sign On, Sign Off, Trip details that are to be performed, meal break location, etc.
- Consolidated Crew report for all duties in a depot for day(s) of the week clearly indicating Sign On, Sign Off, On vehicle, OFF vehicle, Steering time and hours of duty for driver and conductors
- Statistics reports of crew and depot.
- Horizontal Blocks to provide duty wise details of each crew along with the Route number on which they shall perform duty

#### **6.7.2.8.5. Rostering**

The Bidder shall provide a Crew Rostering Software, already used by Public Transport Operators.

- The Software shall have provision for creating the Roster as per Rules, Acts and statutory requirements.
- Crew Rostering module shall be able to create group of users based on set of defined parameters.
- The proposed rostering module shall plan and generate the rostering automatically for next one month to one year.
- It shall allow admin or authorized user to create and view the planning for a week/month before it applies to real production.
- Solution should have provisions to easily make changes to the planned roster
- Solution should have provision to create rosters for user definable day types such as Public Holidays, weekends etc.
- Solution should have capability to automatically rotate crew as per the user definable parameters
- Ability to create groups and types of crew.
- Ability to assign crew work/duties based on user defined groups
- System should have provision to include non-driving work in the roster
- Solution should have provision to utilise drivers from other Depots
- The proposed rostering application shall display or provide rostering using graphical representation for the selected period
- The Rostering module shall interface with scheduling module to assign crews automatically to the schedule.

- In case schedule is cancelled then rostering shall update crew's operation hours, ideal hours, etc., for day to improve the operation.
- Rostering shall have technique to minimize and help purchaser in identify the non-performing/underperforming crew.
- Scheduling module shall support purchaser to assign the vehicle to particular schedule and number of trips. Forms and acts applicable to purchaser shall be incorporated into the scheduling & rostering module.
- All schedule shall be identified by schedule number and/or start and destination name.
- Schedule master shall have minimum start place, end place, starting and end time of each trip, rest time in between the trips, distance between the start and end place, distance between stops, overnight stay, crew name, fleet registration number, etc.
- Scheduling module shall allow admin or authorized user to update, modify or cancel the schedule.
- It shall also allow user to cancel particular trip that means partial schedule cancellation.
- The proposed application shall allow users to modify/update the schedule quickly.
- Various MIS reports to support shall be provided. The reports include, but are not limited to:
  - Distance Reports
  - Depot Reports
  - Station Reports
  - Route Reports
  - Form-4 Reports
  - Anomalies Reports
  - Dead Kilometre Reports
  - Comparative Reports

#### **6.7.2.8.6. Dispatch/Daily Operations**

- Ability to plan dispatch of depot vehicle using a depot Plan
- System should have functionality and provisions to establish Crew Biometric and smart card based Kiosk, this should be fully integrated with Rostering and Dispatch
- Proposed solution should manage multiple Depots from the one screen
- Data from multiple should be available one screen for operations manager/starter to make decisions.
- The Dispatch module should be fully integrated and have availability of vehicles in real time from workshop.
- The solution should have ability to display the current and future duties to be performed by the staff.
- Solution should have provision to easily swap work between crew.
- Solution should have provision to Easily sway work between vehicles

- Solution should have provision to handle on-road vehicle changes due to accidents, breakdowns etc.
- The solution should have provisions to capture driver licenses and other statutory documents
- System should alert various stake holders including driver in case the document has expired and need to be renewed
- Solution should have provisions to manage crew contact details
- Ability to volunteer for additional work by crew from the crew kiosks
- Solution should have detailed shift information available to operations manager/ starter
  
- Solution should have ability to change how many hours are required by crew to perform a duties and highlight the overtime in case it is required
- Solution should highlight the workshop plan and vehicles required for workshop maintenance for the period
- Solution should have capability to send the SMS messaging to crew, either in bulk or individually
- Ability to send SMS alerts if crew late for work
- Ability to send SMS alert to crew if work has changed
- System should flag and give Late crew popup alerts
- Ability to sort vehicle / drivers as required
- Solution should have ability to incorporates Charter work
- Ability to apply skill restrictions at a Shift or vehicle level
- Gate processes for Vehicle In/Out from the Depots shall be captured in the system.
- Depot manager shall be provided real-time information and reports on staff presence from the system using the Proximity reader data.

**6.7.2.8.7. Performance Monitor**

- Ability to capture KPI events as they occur
- Ability to define and manage company workflows
- Ability to capture crew performance
- Ability to capture depot performance
- Ability to capture incidents and trigger the training requirements for the crew
  
- Ability to define level of detail from minor to complex as per company or regulatory requirements
- Seamless creation of records for Operations, Workshop and Management

**6.7.2.8.8. Charter module**

- Solution should cater for the entire process – Quote > Booking > Allocation > Invoicing
  
- Solution should maintain customer records and historic data

- Ability to handle multiple costing options – Charter Group, Coach Rates, Charter types
- Ability to do multi day bookings
- Solution should maintain and handle destinations details / Node information recording
- Solution should have Web based customer enquires
- Ability to record and report on Charter source
- Ability to perform recurring and repeating Charter requirements
- Ability to specify vehicle types and options associated with them
- While creating the charter requirement user should have Vehicle availability view
- Ability to access charter calendar that accommodates advance searching and caters for the entire booking process.
- Ability to directly email correspondence to clients – Quotes, Confirmations etc.

#### **6.7.2.8.9. Route Condition Monitoring**

Route Condition/Status Monitoring application provides real-time information about the operational status of the route. They identify how the route is performing compared to the planned performance. They are typically implemented as a supporting application within a AVLS system.

The application compares the real-time information about the route (vehicle location, speed, speed variances, delays) with the planned service (timetable, headways, running times). It identifies where the service is operating as planned, where it is at variance with the plan, and usually also analyses the severity of the variance. Optionally, it may acquire real-time and pre-planned information from external sources about events, disruptions, etc.

The application presents the route condition to specified end-users. Most typically, this is to the AVLS dispatcher. In these cases, the route condition is presented in graphic and numeric format. This includes:

- Summary indicator of status of all routes
- Summary indicator of status of all routes assigned to the dispatcher or dispatcher cluster
- Condition status of individual routes
- Optionally, only alerts and variances beyond performance tolerance are shown

Route condition monitoring application shall use visual tools to highlight the important information. Methods include:

- Representation of the intervals between vehicles, either on the route map or as a separate screen
- Color-coding of variances to indicate early/late running, bunching, excessive intervals
- Flashing symbols for variances that need close attention
- Audio alerts
- Listing of key variances, optionally ordered by priority

Route Condition Monitoring can also feed other systems. Real-time passenger information, traveler alert services, and journey planners can receive route condition information and include it in the advice provided to passengers. It can also be channeled to operations support staff, and to external entities.

#### **6.7.2.8.10. Dynamic rescheduling**

Dynamic Rescheduling is a facility within a AVLS system that allows the schedule to be adjusted in real time or semi-real time in response to prevailing circumstances.

Dynamic rescheduling can operate at various levels of complexity, including the following situations:

- Smoothing the schedule or headway pattern when a vehicle is missing
- Recalculating the schedule or headway pattern when one or more additional vehicles are operated on a route (e.g. in response to unusually high demand)
- Recalculating the schedule and intermediate times when a route diversion takes place
- Recalculating the schedule based on the actual overall or sectional running times
- Creating an alternative schedule in case of serious disruption

In some cases, following the dynamic rescheduling process, the revised schedule is transmitted to the in-vehicle devices and to the real-time traveler's information channels. This ensures that the information channels can provide a reasonably accurate level of information to travelers. This is particularly important if the route or list/sequence of stops is adjusted.

#### **6.7.2.9. Depot Management System**

Depot management plays a very important role in ensuring availability and safety of the transit system buses. Depot resources are required to carry out day-to-day maintenance of vehicles, preventive & predictive maintenance schedules. The depot management process shall be primarily responsible to following functions are carried out:

- Crew Rostering using DMS
- Vehicle Scheduling using scheduling system
- Vehicle Dispatch using CAD system
- Vehicle maintenance and operational requirements like fuel etc. using DMS
- Maintenance expenses

Depot management system shall primarily manage crew required for bus operations, vehicles, routes, schedule management etc. The operations & maintenance processes with respect to buses shall be captured by the system. The Bidder shall provide customization to the software based on the functional and technical requirements of the project.

Crew Rostering module shall be able to create group of users based on set of defined Parameter's by ASCL/ACTSL. The proposed rostering module shall plan, optimize and generate the rostering automatically for month to one year. It shall allow admin or authorized user to create and view the planning for a defined period of time. The proposed rostering application shall display or provide



rostering using graphical representation for the selected period and shall interface with scheduling module to assign crews automatically to the schedule. The Rostering module shall interface with HR system to update crew absence, holidays, etc. In event schedule deviations, rostering shall update crew's operation hours, ideal hours, etc., for day to improve the operation. Rostering system shall have optimization technique to minimize and identify the underperforming crew. The proposed rostering shall provide individual or group wise performance in graphical user interface. That including working, non-working hours, holiday, leave, over time, etc.

DMS process shall provide productivity reports to ensure insights into operations such as:

- Crew allocation
- Schedule allocation
- Crew utilization report
- Fleet departure at depot
- Fleet dead KM per route/ fleet wise
- Revenue kilometre
- Schedule or trip cancellation
- Crew license renewal history
- Over time details per staff wise
- Fuel stock per month/ week/ per day
- Fuel consumption every day
- Fleet wise fuel consumption
- Vehicle service alerts

DMS shall also provide functionality for workshop management and following modules shall be offered:

- Body repairs
- Fitness Certificate Renewal
- Reconditioning of assemblies and engines
- Retrieving of spares
- Tyre re-treading
- Repairs and reconditioning

The application shall provide query by fleet to view and update the fleet status. The application shall have features to capture daily progress of particular vehicle department-wise to track progress by type of workshop activity (accident, engine rebuild, fitness certificate, etc.). All the documents related to vehicles like vehicle registration, FC, Road permit, Staff ID proof, License, purchase orders etc. shall be scanned and uploaded into corresponding sub systems like DMS, WMS, Stores, and HR & Payroll.

Application shall have features to capture and report vehicle-wise insurance claims, road permit, etc. DMS module shall interface with workshop module to update maintenance detail.

The following MIS reports form the tentative list. Additional reports may be added during design discussions and pilot implementation.

- Breakdown
- Accident
- Vehicle in/ out
- Pending Maintenance
- KMPL for each Fleet
- Vehicle FC, Road permit history
- Complete history of each vehicle maintenance by month and year

#### **6.7.2.9.1. Stores and Inventory**

The proposed Stores and Inventory application shall have features to generate purchase orders, maintenance contractor details, previous quotes, etc. Asset management system to maintain all the physical items belongs to this project. Application shall have receipt of incoming goods/ GRN. The application shall support barcode reader to read the item information, warranty, etc. and register into application. Barcode reader to read the goods while procuring and it shall register into the system for inventory.

Barcode reader to check the goods warranty, batch, year of manufacture, etc. by reading the barcode label on the goods. The application shall have provision to track goods transferred to other depots. Each item shall set with threshold level for stock. When the stock is going below threshold then system shall send alerts to concerned person(s) or department.

The system shall have warranty information for each item. There shall be a provision to note the physical stock location number on the application to identify the stock easily. All the items entered into system with date of manufacture, date of warranty expiry, batch, date of purchase, etc. Query screen to check warranty information of particular item shall be available. Asset shall have unit make, model, part number and location of asset for both movable and immovable. Stock management shall be able to capture new and used items.

The following MIS reports form the tentative list. Additional reports might be added during design/pilot stage.

- Monthly Stock detail
- Item wise Stock
- Item name & code with Warranty
- Stores accounting value
- Utilized stock
- Inventory control
- Maintenance of stock record
- Stock transfer
- Asset Detail
- Asset Summary – depot wise, division wise

#### **6.7.2.9.2. Depot Personnel HR and Payroll**

The proposed application shall store employee related master details without any limitation. The employees from ACTSL, Contractors, etc.as identified during the design stage. Attendance shall be recorded using Proximity Readers installed at various places depots. The system shall not allow any records to be deleted. But it shall allow admin to edit employee personal info, others as required.HR & Payroll System is expected to be accessible from all the depots, terminals, Inter-changes and main office. Additional locations shall be identified during design stage.

HR & Payroll System access shall be configurable based on location/user type/user group.

The Super User or Admin shall have access to all the data. The Master table shall have minimum of Date of birth, Date of Joining, Earlier Service Experience, Department, Designation, Seniority, Salary, etc.HR system shall interface with Depot Management System to provide crew absence. The system shall maintain staff's ESI, PF and other mandatory processes. Application shall have provision to request transfer to other depots or other places. Staff shall be able to generate their salary slip using their ID & password.

Staff shall be able to check available vacation and sick leave using the system.

The following MIS reports form the tentative list. Additional reports might be added during design/pilot stage.

#### **6.7.2.9.3. Human Resource Management**

- Employee Management
- Leave Management
- Service Management
- Training Management reporting
- Etc.

#### **6.7.2.9.4. Payroll Application Requirements**

Standard payroll application with following features:

- Monthly Salary management with statutory management functions like standard deduction, Payroll summary, Income tax, Form 16A and other reports as per Govt. of India
- PF, ESI, Professional Tax, Labour laws etc.
- Over time details and salary
- Bonus statement & Insurance
- Disbursals Management

#### **6.7.2.10. Incident Management System**

Incident management is the process of managing multi-agency, multi-jurisdictional responses to disruptions. Efficient and coordinated management of incidents reduces their adverse impacts on public safety, traffic conditions, and the local economy. Incident management yields significant benefits through reduced vehicle delays and enhanced safety to motorists through the reduction of incident frequency and improved response and clearance times.

Incident management is a planned effort to use all resources available to reduce the impact of incidents and improve the safety of all involved.

#### **6.7.2.10.1. Emergency/incident management**

Emergency/incident Management shall be handled through the AVLS. In general, the strategies for emergency/incident management shall be developed at a broader organizational level, and shall involve many stakeholders including the AVLS system.

**Emergency/incidents can be clustered in three levels, which have differing levels of response:**

- Individual vehicle or location
- Impacting only the public transport services
- Impacting the urban area and utilities, of which public transport is one

**Emergency/incidents cover the following scenarios:**

- Breakdown of vehicle or collision, requiring technical assistance or replacement
- Collision, illness or other non-criminal incident requiring medical support
- Assault, aggressive or security incident, requiring police/security response
- Pre-advised diversion or restriction due to road construction/repairs or other cause
- Unplanned diversion or restriction
- Weather-related events and restrictions
- Events, requiring diversions and/or additional services

For the most part, when such incidents occur, the Operations Management is achieved through the AVLS system, and the Route Condition Monitoring and Schedule Adherence applications. SOP's shall govern the management of various incident types, and activated as required.

**Specific Transit Management System supports for emergency/incident management include:**

- Alarm/alert initiated by the driver. This can override the normal communication protocols and get priority alert to the dispatcher.
- For known disruptions (e.g. planned road work, events) temporary route diversions, temporary schedules and adjusted sectional running times can be pre-programmed into the AVLS system and activated for the period of the works
- For occasional disruptions (e.g. key street unavailable), alternative plans can be stored within the AVLS system, and activated whenever a trigger event occurs (e.g. weather alert, demonstration).
- Data exchange among the transportation and security agencies
- Traffic signal adjustment in the vicinity of the disruption areas

The incident management process shall include:

- Detection
- Verification
- Motorist Information
- Response

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- Site Management
- Traffic Management
- Clearance

This system would ideally execute following phases:

- Notification phase
- Response phase
- Recovery phase
- Restoration phase

**6.7.2.11. Fixed Mini-Dome camera for City Buses**

#	Parameters	Minimum Specifications	Bidder Compliance (Yes/No)	Product Documentation Reference
1.	<b>Make</b>		<to be provided by the bidder>	
2.	<b>Model</b>		<to be provided by the bidder>	
3.	Video Compression	H.264		
4.	Video Resolution	1920 X 1080		
5.	Frame rate	Min. 25 fps		
6.	Image Sensor	1/3" Progressive Scan CMOS		
7.	Lens	Fixed 2.8 mm HD lens or better		
8.	Minimum Illumination	Colour: 0.5 lux, B/W: 0 lux with IR On		
9.	IR Range	20 Mtrs or better		
10.	Day/Night Mode	Colour, Mono, Auto		
11.	S/N Ratio	≥ 50Db		
12.	Auto adjustment + Remote Control of Image settings	Colour, brightness, sharpness, contrast, white balance, exposure control, backlight compensation, Gain Control, Wide Dynamic Range		
13.	Protocol	HTTP, HTTPS, FTP, RTSP, RTP, TCP, UDP, RTCP, DHCP, UPnP, QoS, IPV4, IPV6, ONVIF Profile S		
14.	Security	Password Protection, IP Address filtering, User Access Log, HTTPS encryption		
15.	Operating conditions	As per Allahabad weather conditions		
16.	Casing	NEMA 4X / IP-66 rated and IK10 rated		
17.	Certification	UL/EN,CE,FCC		
18.	Local storage	Minimum 64 GB Memory card in a Memory card slot. In the event of failure of connectivity to the central server the camera shall record video locally on the SD		

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#	Parameters	Minimum Specifications	Bidder Compliance (Yes/No)	Product Documentation Reference
		card automatically. After the connectivity is restored these recordings shall be automatically merged with the server recording such that no manual intervention is required to transfer the SD card based recordings to server.		
19.	Power Source	PoE, 12V		

**6.7.2.12. Mobile NVR for City Buses**

#	Minimum Specifications	Bidder Compliance (Yes/No)	Product Documentation Reference
1.	<b>Make</b>	<to be provided by the bidder>	
2.	<b>Model</b>	<to be provided by the bidder>	
3.	1 DIN Standard Size		
4.	Shock Absorbent Design		
5.	1 TB Hard disk or better, 1 Memory card		
6.	Wi-Fi module (802.11 b/g/n supported, 2.4GHz)		
7.	4 Channel Real-time H.264 encoding, 25 fps		
8.	Signals, Ethernet and USB Interfaces		
9.	Temperature as per Allahabad city requirements		

**6.7.2.13. Handheld Ticketing Machine**

#	Parameters	Minimum Specifications	Bidder Compliance (Yes/No)	Product Documentation Reference
1.	<b>Make</b>	<to be provided by the bidder>		
2.	<b>Model</b>	<to be provided by the bidder>		
3.	Processor	As per application requirements		
4.	Memory	128 MB Flash, 64 MB RAM		
5.	External Memory	Micro SD card		
6.	Display	3.5 Inch, 320X240 Color TFT Touch Screen		
7.	Magnetic Card reader	Triple Track, Bi-Directional		
8.	Card slots	Minimum 2 SAM Slots		
9.	Smart card reader	Contact Smartcard reader		
10.	Contactless card reader	EMV/Rupay contactless, ISO 14443 A/B, Mifare Family (Classic, Desfire, etc.), Felica etc. contactless smartcard reader		

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#	Parameters	Minimum Specifications	Bidder Compliance (Yes/No)	Product Documentation Reference
11.	Printer	To be provided as per the application requirement		
12.	Keypad	To be provided as per the application requirement		
13.	Battery	Li-ion batteries, 1800 mAH or higher		
14.	Communication	GPRS		
15.	Peripheral ports	USB OTG RS232		
16.	Security	DES, 3DES, AES, DUKPT		
17.	Environmental	As per Allahabad weather conditions		
18.	Voltage	Input: 100~240VAC, 50Hz / 60Hz, 1.0A, Output: 9VDC, 2.5A		
19.	Certification	EMV Certified Level 1 & 2		
20.	Operating System	Linux / Windows/ Android (4.2 or above)		
21.	Accessories	Shoulder bag, AC Charger, Memory Card - 2GB, Extra Battery		
22.	Administration	Remote Administration, OTA for firmware, Application and Configuration		
23.	Support	Database handling API, Embedded TCP/IP Stack, Parallel Programming Support		
24.	Communication Ports	USB & RS232 - 1 Each		

**6.7.2.14. Pole Mounted Ticket Validator for City Buses**

#	Minimum Specifications	Bidder Compliance (Yes/No)	Product Documentation Reference
1.	<b>Make</b>	<to be provided by the bidder>	
2.	<b>Model</b>	<to be provided by the bidder>	
3.	Conforms to strict ergonomic criteria for mass transit devices.		
4.	Special fast pole mounting bracket facility.		
5.	Notification of a successful validation provided via an in-built optical alarm. It is also equipped with sensors which prevent repeated validation.		
6.	The validator can operate both in a controlled and autonomous mode.		

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#	Minimum Specifications	Bidder Compliance (Yes/No)	Product Documentation Reference
7.	It should be possible to block the validator remotely.		
8.	The device equipped with a four-figure time display.		
9.	Validator should be designed to take up as little space as possible and to meet the strict ergonomic requirements for mass transit devices.		
10.	The validator should be passenger operated via a contactless smartcard and paper based QR Ticket.		
11.	A 32bit processor and sufficient memory & provide a high security and rapid response to every transaction.		
12.	Transactions shall be approved by two back-lit symbols and by an audible sound.		
13.	Types of displays. 240x320p 5,7"(Approximately)		
14.	The device can be supplied with various types and dimensions of displays.		
15.	The SAM module interface provides highly secured communication and easy implementation into integrated transport system.		
16.	The device works with open OS Linux, which makes administration and further modifications easier.		
17.	Audio interface AC97 enables using mp3, wav and other formats of audio files.		

**6.7.2.15. Point of Sale (PoS) Machine**

#	Parameters	Minimum Specifications	Bidder Compliance (Yes/No)	Product Documentation Reference
1.	<b>Make</b>		<to be provided by the bidder>	
2.	<b>Model</b>		<to be provided by the bidder>	
3.	Processor	Intel Atom / Dual Core & Above		
4.	Processor Speed	1.6 GHz and above		
5.	Cache Memory	1 MB		
6.	RAM	2 GB RAM minimum		
7.	Nos. of Slots	As per solution requirements. Scalable minimum 1 slot		
8.	HDD	As per solution design requirements		
9.	USB Port	4 USB Ports		



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#	Parameters	Minimum Specifications	Bidder Compliance (Yes/No)	Product Documentation Reference
10.	Serial Port	2 x RS232 Ports		
11.	Parallel Port	1 x Parallel Port		
12.	Monitor (Size)	15" TFT LCD – Touch		
13.	Operating System	Linux / Windows / Android 4.2 and above with required OS and licenses		
14.	Thermal Printer	3" Width, Auto Cutter or better		
15.	Accessories	Cash Till/Cash Vault		
16.	Customer Display	LCD Based Customer Display		
17.	Smartcard Reader	Contactless Card Reader ISO 14443 A/B, MiFare family (classic, Ultralight 'c' DesFire, etc.). contactless smartcard reader		

**6.7.2.16. PIS LED Display for Bus Shelters (2 Rows)**

#	Parameters	Minimum Specifications	Bidder Compliance (Yes/No)	Product Documentation Reference				
1.	<b>Make</b>	<to be provided by the bidder>						
2.	<b>Model</b>	<to be provided by the bidder>						
3.	Display Size	Two horizontal LED panels, joined horizontally Size of each display : As per following <table><tr><td>1</td><td>900 mm x 200 mm</td></tr><tr><td>2</td><td>900 mm x 200 mm</td></tr></table>	1	900 mm x 200 mm	2	900 mm x 200 mm		
1	900 mm x 200 mm							
2	900 mm x 200 mm							
4.	Type of LED	Diffused lens 4 mm (minimum) or SMD PLCC- 2 LED						
5.	Color	Amber colored LED						
6.	Wavelength	Wave length 591~595nm						
7.	Viewing distance	30 meters, for single line text, in day and night						
8.	Viewing Angle	120°H / 60°V						
9.	Readability	Ensure readability with full clarity (no jitter) on scrolls and long life usage						
10.	Light Sensor	In-built light sensor with continuously variable brightness control to enable the display intensity to change based on ambient light conditions						
11.	Graphics	Alphanumeric text with customized graphic capability						
12.	Language	English, Hindi						

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#	Parameters	Minimum Specifications	Bidder Compliance (Yes/No)	Product Documentation Reference
13.	Messages	Fixed, scrolling and flashing mode Display of Stop Name, ETA of bus with bus route number Display public service information / adhoc messages Current date and time		
14.	Memory	Ability to retain the last message displayed in the memory of the sign even in the event of power failure and without the message being reloaded.		
15.	Cabinet Design	Light weight structure with toughened glass at the front side Antitheft and anti-vandalism proof		
16.	IP Protection	IP 65		
17.	Protection	The Display unit to be mounted inside an anti-theft and anti-vandalism proof Enclosure		
18.	EMI/EMC	Test complied as per – AIS004 Part 3		
19.	Temperature	As per Allahabad weather conditions		
20.	Humidity	As per Allahabad weather conditions		
21.	Usage	24x7x365		
22.	Communication	Through GPRS (SIM based) or Local LAN port (to be connected to switch)		
23.	Power	AC Power (100-240V AC)		
24.	Protection	Over voltage, Reverse Polarity, ESD, Communication lines protection		

**6.7.2.17. PIS LED Multi Line Display for Bus Terminals**

#	Parameters	Minimum Specifications	Bidder Compliance (Yes/No)	Product Documentation Reference
1.	<b>Make</b>		<to be provided by the bidder>	
2.	<b>Model</b>		<to be provided by the bidder>	
3.	Display Size	Six horizontal LED panels, joined horizontally		

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#	Parameters	Minimum Specifications	Bidder Compliance (Yes/No)	Product Documentation Reference												
		Size of each display : As per following <table><tr><td>1</td><td>900 mm x 100 mm</td></tr><tr><td>2</td><td>900 mm x 100 mm</td></tr><tr><td>3</td><td>900 mm x 100 mm</td></tr><tr><td>4</td><td>900 mm x 100 mm</td></tr><tr><td>5</td><td>900 mm x 100 mm</td></tr><tr><td>6</td><td>900 mm x 100 mm</td></tr></table> Overall cabinet 1000 mm x 700 mm (approx.)	1	900 mm x 100 mm	2	900 mm x 100 mm	3	900 mm x 100 mm	4	900 mm x 100 mm	5	900 mm x 100 mm	6	900 mm x 100 mm		
1	900 mm x 100 mm															
2	900 mm x 100 mm															
3	900 mm x 100 mm															
4	900 mm x 100 mm															
5	900 mm x 100 mm															
6	900 mm x 100 mm															
4.	Type of LED	Diffused lens 4 mm (minimum)/SMD PLCC														
5.	Color	Amber colored LED														
6.	Wavelength	Wave length 591~595nm														
7.	Viewing distance	30 meters, for single line text, in day and night														
8.	Viewing Angle	120 degree Horizontal/60 Degree Vertical														
9.	Readability	Ensure readability with full clarity (no jitter) on scrolls and long life Usage														
10.	Light Sensor	In-built light sensor with continuously variable brightness control to enable the display intensity to change based on ambient light conditions														
11.	Graphics	Alphanumeric text with customized graphic capability, 50 mm minimum for English Characters														
12.	Language	English, Hindi														
13.	Messages	Fixed, scrolling and flashing mode Display of Stop Name, ETA of bus with bus route number Display public service information / adhoc messages Current date and time														
14.	Memory	Ability to retain the last messages displayed in the memory of the sign even in the event of power failure and without the message being														

#	Parameters	Minimum Specifications	Bidder Compliance (Yes/No)	Product Documentation Reference
		reloaded. (minimum 8 GB memory)		
15.	Cabinet Design	Light weight structure with toughened glass at the front side Antitheft and anti-vandalism proof		
16.	IP Protection	IP 65		
17.	Protection	The Display unit to be mounted inside an anti-theft and anti-vandalism proof Enclosure		
18.	Temperature	As per Allahabad weather conditions		
19.	Humidity	As per Allahabad weather conditions		
20.	Usage	24x7x365		
21.	Communication	Through GPRS (SIM based) or Local LAN port (to be connected to switch)		
22.	Power	AC Power (100-240V AC)		
23.	Protection	Over voltage, Reverse Polarity, ESD, Communication lines protection		

#### **6.8. Environmental Sensors**

The functional requirements and technical specifications provided in the below sections and at other sections in this RFP are indicative and carry guiding rule. The MSI is free to offer products and solutions which meet requirements of the RFP focusing on the outcome, future scalability, security, reliability and adherence to specified SLA under this RFP, in line with applicable standards & best practices adopted in the industry. The MSI is encouraged to design an Optimized solution which is technically superior, innovative, proven, better in terms of functionality and is cost effective. Any specified parameters mentioned in the scope/technical requirement in the RFP may be considered if it is required for meeting current & future requirements during the contract period. The MSI is fully responsible for the specified outcome to be achieved.

#.	Minimum Specifications / Functionalities / Capabilities
1	As per prescribed standards, norms and guidelines in the city
2	Environmental sensor should be able to measure Air pressure
3	Environmental sensor should be able to measure Humidity
4	Environmental sensor should be able to measure temperature
5	Environmental sensor should be able to measure Gas (CO, CO2, NO2, SO2)
6	Environment sensor should be able to measure Air Pollution (PM 2.5, PM 10)

### **6.9. Functional Requirements of Artificial Intelligence System with Edge Analytics**

The functional requirements and technical specifications provided in the below sections and at other sections in this RFP are indicative and carry guiding rule. The MSI is free to offer products and solutions which meet requirements of the RFP focusing on the outcome, future scalability, security, reliability and adherence to specified SLA under this RFP, in line with applicable standards & best practices adopted in the industry. The MSI is encouraged to design an Optimized solution which is technically superior, innovative, proven, better in terms of functionality and is cost effective. Any specified parameters mentioned in the scope/technical requirement in the RFP may be considered if it is required for meeting current & future requirements during the contract period. The MSI is fully responsible for the specified outcome to be achieved.

#### **6.9.1. Edge Analytics**

The proposed Edge Analytics should have following mentioned minimum specifications:

1. Should deliver 5.5 teraFLOPS of FP16 performance or better
2. Support Wi-Fi, Bluetooth, 3G/LTE connectivity options
3. Should have 100Mb/1GbE management network link
4. Should support 1GbE (via RJ45) or 10GbE (SFP+)
5. Should have minimum operating temperature to withstand outdoor operating environment as per city conditions

#### **6.9.2. Artificial Intelligence**

Artificial Intelligence with Continuous Learning & Improvement system:

1. Should deliver processing units' performance of 1 petaFLOPS on FP16 or better
2. Should have software tools for achieving the following tasks- Resource allocation, queueing of jobs, performance monitoring and creating software containers
3. Should support commonly used Deep Learning based AI frameworks like TensorFlow, CNTK etc.
4. Should have minimum 512GB system memory per system or better
5. Should have dual 10GbE and 4 IB EDR per system or better
6. Should have minimum power consumption requirements
7. Should have dual 20-core Intel Xeon E5-2698 or better per system.
8. Should support parallel computing architecture.
9. Should support software libraries for continuous learning and improvement for betterment of Intelligent video analytics software installed in edge/field devices using Deep Learning based AI methodologies.

### **6.10. Technical Specifications & Functional Specifications- Data Center**

The functional requirements and technical specifications provided in the below sections and at other sections in this RFP are indicative and carry guiding rule. The MSI is free to offer products and solutions which meet requirements of the RFP focusing on the outcome, future scalability, security,

reliability and adherence to specified SLA under this RFP, in line with applicable standards & best practices adopted in the industry. The MSI is encouraged to design an Optimized solution which is technically superior, innovative, proven, better in terms of functionality and is cost effective. Any specified parameters mentioned in the scope/technical requirement in the RFP may be considered if it is required for meeting current & future requirements during the contract period. The MSI is fully responsible for the specified outcome to be achieved.

#### **6.10.1. Core Router**

#	Parameters	Minimum Specifications	Bidder Compliance (Yes/No)	Product Documentation Reference
1.	<b>Make</b>		<to be provided by the bidder>	
2.	<b>Model</b>		<to be provided by the bidder>	
3.	Multi-Services	Should deliver multiple IP services over a flexible combination of interfaces		
4	Ports	As per overall network architecture proposed by the bidder, the router should be populated with required number of LAN/WAN ports/modules, with cable for connectivity to other network elements.		
5.	Speed	As per requirement, to cater to entire bandwidth requirement of the project.		

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#	Parameters	Minimum Specifications	Bidder Compliance (Yes/No)	Product Documentation Reference
6.	Interface modules	Must support minimum 2* 10G Port with necessary SFP+ Modules. Must have capability to interface with variety interfaces.		
7.	Protocol Support	Must have support minimum for TCP/IP, PPP Must support IPSEC VPN Must have support for integration of data and voice services Routing protocols of RIP, OSPF, and BGP. Support IPV4 & IPV6, any other protocol support as per application requirements		
8.	Manageability	Must be SNMP manageable		
9.	Scalable	<ul style="list-style-type: none"> <li>The router should be scalable. For each slot multiple modules should be available.</li> <li>The chassis offered must</li> </ul>		

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#	Parameters	Minimum Specifications	Bidder Compliance (Yes/No)	Product Documentation Reference
		have free slots to meet the scalability requirement of expansion of the project in the future.		
10.	Traffic control	Traffic Control and Filtering features for flexible user control policies		
11.	Remote Access	Remote access features		
12.	Redundancy	<ul style="list-style-type: none"> <li>Redundancy in terms of Power supply(s). Power supply should be able to support fully loaded chassis</li> <li>All interface modules, power supplies should be hot-swappable</li> </ul>		
13.	QOS Features	<ul style="list-style-type: none"> <li>RSVP</li> <li>Priority Queuing</li> <li>Policy based routing</li> <li>Traffic shaping</li> <li>Time-based QoS Policy</li> <li>Bandwidth Reservation / Committed</li> </ul>		



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#	Parameters	Minimum Specifications	Bidder Compliance (Yes/No)	Product Documentation Reference
		Information Rate		

**6.10.2. Internet Router**

#	Parameters	Minimum Specifications	Bidder Compliance (Yes/No)	Product Documentation Reference
1	<b>Make</b>		<to be provided by the bidder>	
2.	<b>Model</b>		<to be provided by the bidder>	
3.	Multi-Services	Should deliver multiple IP services over a flexible combination of interfaces		
4	Ports	As per overall network architecture proposed by the bidder, the router should be populated with required number of LAN/WAN ports/modules, with cable for connectivity to other network elements.		
5.	Speed	As per requirement, to cater to entire bandwidth requirement of the project.		

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#	Parameters	Minimum Specifications	Bidder Compliance (Yes/No)	Product Documentation Reference
6.	Interface modules	Must support minimum 2* 10G Port with necessary SFP+ Modules. Must have capability to interface with variety interfaces.		
7.	Protocol Support	Must have minimum support for TCP/IP, PPP Must support IPSEC VPN Must have support for integration of data and voice services Routing protocols of RIP, OSPF, and BGP. Support IPV4 & IPV6, , any other protocol support as per application requirements		
8.	Manageability	Must be SNMP manageable		
9.	Scalable	<ul style="list-style-type: none"> <li>The router should be scalable. For each slot multiple modules should be available.</li> <li>The chassis offered must</li> </ul>		

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#	Parameters	Minimum Specifications	Bidder Compliance (Yes/No)	Product Documentation Reference
		have free slots to meet the scalability requirement of expansion of the project in the future.		
10.	Traffic control	Traffic Control and Filtering features for flexible user control policies		
11.	Remote Access	Remote access features		
12.	Redundancy	<ul style="list-style-type: none"> <li>Redundancy in terms of Power supply(s). Power supply should be able to support fully loaded chassis</li> <li>All interface modules, power supplies should be hot-swappable</li> </ul>		
13.	QOS Features	<ul style="list-style-type: none"> <li>RSVP</li> <li>Priority Queuing</li> <li>Policy based routing</li> <li>Traffic shaping</li> <li>Time-based QoS Policy</li> <li>Bandwidth Reservation / Committed</li> </ul>		

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#	Parameters	Minimum Specifications	Bidder Compliance (Yes/No)	Product Documentation Reference
		Information Rate		

**6.10.3. Firewall**

#	Parameters	Minimum Specifications	Bidder Compliance (Yes/No)	Product Documentation Reference
1.	<b>Make</b>		<to be provided by the bidder>	
2.	<b>Model</b>		<to be provided by the bidder>	
3.	Physical attributes	<ul style="list-style-type: none"> <li>Should be mountable on 19" Rack</li> <li>Modular Chassis/Appliance Design</li> <li>Internal redundant power supply</li> </ul>		
4.	Interfaces	<ul style="list-style-type: none"> <li>Should have minimum 4X1GE ports and 2X10G port with necessary SFP loaded from day one. Should be scalable to add 2 or more 10G ports in future.</li> <li>Console Port 1 number</li> </ul>		
5.	Performance and Availability	Encrypted throughput, Concurrent connections, Simultaneous VPN tunnels should be configured as per application/design requirement. However, the bidder to provision minimum 50% higher capacity on Day 1 for future requirements		
6.	Routing Protocols	<ul style="list-style-type: none"> <li>Static Routes</li> <li>RIPv1, RIPv2</li> <li>OSPF</li> </ul>		
7.	Protocols	<ul style="list-style-type: none"> <li>TCP/IP</li> <li>RTP</li> <li>IPSec, DES/3DES/AES</li> <li>FTP, HTTP, HTTPS, SNMP, SMTP</li> <li>DHCP, DNS, Support for IP v4 &amp; IPv6</li> <li>IPSEC</li> </ul>		
8.	Other support	<ul style="list-style-type: none"> <li>802.1Q, NAT, PAT, IP Multicast support, Remote Access VPN, Time based Access control lists, URL Filtering, support VLAN, Radius/</li> </ul>		

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#	Parameters	Minimum Specifications	Bidder Compliance (Yes/No)	Product Documentation Reference
		TACACS, Support multilayer firewall protection, Traffic shaping, Bandwidth monitoring		
9.	QoS	<ul style="list-style-type: none"> <li>QoS features like traffic prioritization, differentiated services, committed access rate. Should support for QoS features for defining the QoS policies.</li> </ul>		
10.	Management	<ul style="list-style-type: none"> <li>Console, SSHv2, Browser based configuration</li> <li>SNMPv1, SNMPv2, SNMPv3</li> </ul>		
11.	Additional Features	<ul style="list-style-type: none"> <li>Should have inbuilt HDD</li> <li>Should support DDoS protection</li> </ul>		
12.	Certifications	ICSA/NDPP/EAL4		

#### **6.10.4. Intrusion Prevention System**

This can be offered as separate unit or as a module in firewall

#	Parameters	Required Specifications	Bidder Compliance (Yes/No)	Product Documentation Reference
1.	<b>Make</b>		<to be provided by the bidder>	
2.	<b>Model</b>		<to be provided by the bidder>	
3.	Performance	Encrypted throughput, Concurrent connections, Simultaneous VPN tunnels should be configured as per application/design requirement. However, the bidder to provision minimum 50% higher capacity on Day 1 for future requirements		
4.	Features	<p>IPS should have Dual Power Supply</p> <p>IPS system should be transparent to network, not default gateway to Network</p> <p>IPS system should have Separate interface for secure management</p> <p>IPS system should be able to protect Multi Segment in the network, should be able to protect 4 segments.</p>		

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#	Parameters	Required Specifications	Bidder Compliance (Yes/No)	Product Documentation Reference
5.	Real Time Protection	<ul style="list-style-type: none"> <li>• Web Protection</li> <li>• Mail Server Protection</li> <li>• Cross Site Scripting</li> <li>• SNMP Vulnerability</li> <li>• Worms and Viruses</li> <li>• Brute Force Protection</li> <li>• SQL Injection</li> <li>• Backdoor and Trojans</li> </ul>		
6.	Stateful Operation	<ul style="list-style-type: none"> <li>• TCP Reassembly</li> <li>• IP Defragmentation</li> <li>• Bi-directional Inspection</li> <li>• Forensic Data Collection</li> <li>• Access Lists</li> </ul>		
7.	Signature Detection	Should have provision for Real Time Updates of Signatures, IPS Should support Automatic signature synchronization from database server on web Device should have capability to define User Defined Signatures		
8.	Block attacks in real time	<ul style="list-style-type: none"> <li>• Drop Attack Packets</li> <li>• Reset Connections</li> <li>• Packet Logging</li> <li>• Action per Attack</li> </ul>		
9.	Alerts	<ul style="list-style-type: none"> <li>• Alerting SNMP</li> <li>• Log File</li> <li>• Syslog</li> <li>• E-mail</li> </ul>		
10.	Management	<ul style="list-style-type: none"> <li>• SNMP v1, v2, v3</li> <li>• HTTP/HTTPS</li> <li>• SSHv2, Console</li> </ul>		
11.	Security Maintenance	<ul style="list-style-type: none"> <li>• IPS Should support 24/7 Security Update Service</li> <li>• IPS Should support Real Time signature update</li> <li>• IPS Should support Provision to add static own attack signatures</li> </ul>		

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#	Parameters	Required Specifications	Bidder Compliance (Yes/No)	Product Documentation Reference
		<ul style="list-style-type: none"> <li>System should show real-time and History reports of Bandwidth</li> </ul>		

**6.10.5. Data Center Switch (Manageable)**

(To be used for Data center LAN Switch)

#	Parameters	Minimum Specifications	Bidder Compliance (Yes/No)	Product Documentation Reference
1.	<b>Make</b>		<to be provided by the bidder>	
2.	<b>Model</b>		<to be provided by the bidder>	
3.	Ports	<ul style="list-style-type: none"> <li>24 or 48 (as per requirements) 10/100/1000 Base-TX Ethernet ports and extra 2 nos of Base-SX/LX ports</li> <li>All ports can auto-negotiate between 10Mbps/ 100Mbps/ 1000Mbps, half-duplex or full duplex and flow control for half-duplex ports.</li> </ul>		
4.	Switch type	Layer 3		
5.	MAC	As per solution design. However, the bidder to provision minimum 50% higher capacity on Day 1		

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#	Parameters	Minimum Specifications	Bidder Compliance (Yes/No)	Product Documentation Reference
		for future requirements		
6.	Backplane	As per solution design. However, the bidder to provision minimum 50% higher capacity on Day 1 for future requirements		
7.	Forwarding rate	As per solution design. However, the bidder to provision minimum 50% higher capacity on Day 1 for future requirements		
8.	Port Features	Must support Port Mirroring, Port Trunking and 802.3ad LACP Link Aggregation port trunks		
9.	Flow Control	Support IEEE 802.3x flow control for full-duplex mode ports.		
10.	Protocols	<ul style="list-style-type: none"> <li>Support 802.1D, 802.1S, 802.1w, Rate limiting</li> <li>Support 802.1Q VLAN encapsulation, IGMP v1, v2 and v3 snooping</li> <li>802.1p Priority Queues, port mirroring, DiffServ</li> </ul>		



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#	Parameters	Minimum Specifications	Bidder Compliance (Yes/No)	Product Documentation Reference
		<ul style="list-style-type: none"> <li>• Support based on 802.1p priority bits with at least 8 queues</li> <li>• DHCP support &amp; DHCP snooping/relay/ optional 82/ server support</li> <li>• Shaped Round Robin (SRR) or WRR scheduling support.</li> <li>• Support for Strict priority queuing &amp; Sflow</li> <li>• Support for IPV6 ready features with dual stack</li> <li>• Support up-to 255 VLANs and up-to 4K VLAN IDs</li> </ul>		
11.	Access Control	<ul style="list-style-type: none"> <li>• Support port security</li> <li>• Support 802.1x (Port based network access control).</li> <li>• Support for MAC filtering.</li> <li>• Should support TACACS+ and RADIUS authentication</li> </ul>		
12.	VLAN	<ul style="list-style-type: none"> <li>• Support 802.1Q Tagged VLAN and port based</li> </ul>		

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#	Parameters	Minimum Specifications	Bidder Compliance (Yes/No)	Product Documentation Reference
		VLANs and Private VLAN <ul style="list-style-type: none"> <li>• The switch must support dynamic VLAN Registration or equivalent</li> <li>• Dynamic Trunking protocol or equivalent</li> </ul>		
13.	Protocol and Traffic	<ul style="list-style-type: none"> <li>• Network Time Protocol or equivalent Simple Network Time Protocol support</li> <li>• Switch should support traffic segmentation</li> <li>• Traffic classification should be based on user-definable application types: TOS, DSCP, Port based, TCP/UDP port number</li> </ul>		
14.	Management	<ul style="list-style-type: none"> <li>• Switch needs to have RS-232 console port for management via a console terminal or PC</li> <li>• Must have support SNMP v1,v2 and v3</li> <li>• Should support 4 groups of RMON</li> </ul>		

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#	Parameters	Minimum Specifications	Bidder Compliance (Yes/No)	Product Documentation Reference
		<ul style="list-style-type: none"> <li>Should have accessibility using Telnet, SSH, Console access, easier software upgrade through network using TFTP etc. Configuration management through CLI, GUI based software utility and using web interface</li> </ul>		

**6.10.6. Data Center Switch**

(To be used as Top of the Rack (TOR) switch if required)

#	Parameter	Minimum Specifications	Bidder Compliance (Yes/No)	Product Documentation Reference
1.	<b>Make</b>		<to be provided by the bidder>	
2.	<b>Model</b>		<to be provided by the bidder>	
3.	Ports	<ul style="list-style-type: none"> <li>24 or 48 (as per density required) 1G/ 10G Ethernet ports (as per internal connection requirements) and extra 2 numbers of Uplink ports (40GE)</li> <li>All ports can auto-negotiate between all allowable speeds, half-duplex or full duplex and flow control for half-duplex ports.</li> </ul>		

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#	Parameter	Minimum Specifications	Bidder Compliance (Yes/No)	Product Documentation Reference
4.	Switch type	Layer 3		
5.	MAC	As per solution design. However, the bidder to provision minimum 50% higher capacity on Day 1 for future requirements		
6.	Backplane	As per solution design. However, the bidder to provision minimum 50% higher capacity on Day 1 for future requirements		
7.	Throughput	As per solution design. However, the bidder to provision minimum 50% higher capacity on Day 1 for future requirements		
8.	Port Features	Must support Port Mirroring, Port Trunking and 802.3ad LACP Link Aggregation port trunks		
9.	Flow Control	Support IEEE 802.3x flow control for full-duplex mode ports.		
10.	Protocols	<ul style="list-style-type: none"> <li>• IPV4, IPV6</li> <li>• Support 802.1D, 802.1S, 802.1w, Rate limiting</li> <li>• Support 802.1X Security standards</li> <li>• Support 802.1Q VLAN encapsulation, IGMP v1, v2 and v3 snooping</li> </ul>		

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#	Parameter	Minimum Specifications	Bidder Compliance (Yes/No)	Product Documentation Reference
		<ul style="list-style-type: none"> <li>• 802.1p Priority Queues, port mirroring, DiffServ</li> <li>• DHCP support</li> <li>• Support up to VLANs As per solution design. However, the bidder to provision minimum 50% higher capacity on Day 1 for future requirements</li> <li>• Support IGMP Snooping and IGMP Querying</li> <li>• Support Multicasting</li> <li>• Should support Loop protection and Loop detection,</li> <li>• Should support Ring protection (optional)</li> </ul>		
11.	Access Control	<ul style="list-style-type: none"> <li>• Support port security</li> <li>• Support 802.1x (Port based network access control).</li> <li>• Support for MAC filtering.</li> <li>• Should support TACACS+ and RADIUS authentication</li> </ul>		
12.	VLAN	<ul style="list-style-type: none"> <li>• Support 802.1Q Tagged VLAN and</li> </ul>		

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#	Parameter	Minimum Specifications	Bidder Compliance (Yes/No)	Product Documentation Reference
		port based VLANs and Private VLAN <ul style="list-style-type: none"> <li>The switch must support dynamic VLAN Registration or equivalent</li> <li>Dynamic Trunking protocol or equivalent</li> </ul>		
13.	Protocol and Traffic	<ul style="list-style-type: none"> <li>Network Time Protocol or equivalent Simple Network Time Protocol support</li> <li>Switch should support traffic segmentation</li> <li>Traffic classification should be based on user-definable application types: TOS, DSCP, Port based, TCP/UDP port number</li> </ul>		
14.	Management	<ul style="list-style-type: none"> <li>Switch needs to have a console port for management via a console terminal or PC</li> <li>Must have support SNMP v1,v2 and v3</li> <li>Should support 4 groups of RMON</li> <li>Should have accessibility using Telnet, SSH, Console access, easier software</li> </ul>		

#	Parameter	Minimum Specifications	Bidder Compliance (Yes/No)	Product Documentation Reference
		upgrade through network using TFTP etc. Configuration management through CLI, GUI based software utility and using web interface		
15.	Resiliency	<ul style="list-style-type: none"> <li>Dual load sharing AC and DC power supplies</li> <li>Redundant variable-speed fans</li> </ul>		

#### **6.10.7. Server Load balancer**

1. Server Load Balancing Mechanism
  - a. Cyclic, Hash, Least numbers of users
  - b. Weighted Cyclic, Least Amount of Traffic
  - c. NT Algorithm / Private Algorithm / Customizable Algorithm / Response Time
2. Redundancy Features
  - a. Supports Active-Active and Active-Standby Redundancy
  - b. Segmentation / Virtualization support along with resource allocation per segment, dedicated access control for each segment
3. Routing Features
  - a. Routing protocols RIPv1/RIPv2/OSPF
  - b. Static Routing policy support
4. Server Load Balancing Features
  - a. Server and Client process coexist
  - b. UDP Stateless
  - c. Service Failover
  - d. Backup/Overflow
  - e. Direct Server Return
  - f. Client NAT
  - g. Port Multiplexing-Virtual Ports to Real Ports Mapping
  - h. DNS Load Balancing
5. Load Balancing Applications
  - a. Application/ Web Server, MMS, RTSP, Streaming Media
  - b. DNS, FTP- ACTIVE & PASSIVE, REXEC, RSH,
  - c. LDAP, RADIUS

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6. Content Intelligent SLB
7. HTTP Header Super Farm
8. URL-Based SLB
9. Browser Type Farm
  - a. Support for Global Server Load Balancing
  - b. Global Server Load Balancing Algorithms
  - c. HTTP Redirection,
  - d. HTTP
  - e. DNS Redirection, RTSP Redirection
  - f. DNS Fall-back Redirection, HTTP Layer 7 Redirection
10. SLB should support below Management options
  - a. Secure Web Based Management
  - b. SSH
  - c. TELNET
  - d. SNMP v1, 2, 3 Based GUI
  - e. Command Line
11. Shall support minimum four (4) virtual instances and shall be scalable to 16 instances on the same appliance.
12. Shall have minimum throughput as per solution design. However, the bidder to provision minimum 50% higher capacity on Day 1 for future requirements
13. Shall have minimum of 8x10G SFP+ interfaces from day one.
14. Shall have security features like reverse-proxy firewall, sync-flood and denial of service attack protection from day one

**6.10.8. Servers (As Building block, to establishing computing solution for sub-systems/solutions)**

#	Parameter	Minimum Specifications	Bidder Compliance (Yes/No)	Product Documentation Reference
1.	<b>Make</b>		<to be provided by the bidder>	
2.	<b>Model</b>		<to be provided by the bidder>	
3.	Processor	Latest series/ generation of 64 bit x86 processor(s) with Ten or higher Cores Processor speed should be minimum 2.4 GHz Minimum 2 processors per each physical server		
4.	RAM	Minimum 32 GB Memory per physical server scalable up to 256 GB		
5.	Internal Storage	2 x 300 GB SAS (10k rpm) hot swap		



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#	Parameter	Minimum Specifications	Bidder Compliance (Yes/No)	Product Documentation Reference
6.	Network interface	4 X 10GbE LAN ports for providing Ethernet connectivity Optional: 1 X Dual-port 16Gbps FC HBA (or FCoE) for providing FC connectivity		
7.	Power supply	Dual Redundant Power Supply		
8.	RAID support	As per requirement/solution		
9.	Operating System	Licensed version of 64 bit latest version of Linux/ Microsoft® Windows based Operating system)		
10.	Form Factor	Rack mountable		
11.	Virtualization	Shall support Industry standard virtualization		

#### **6.10.9. Storage**

The minimum Storage requirement for the ICCC project is as below:

#	Minimum Storage Requirement	TB
1	Primary Storage	450
2	Secondary Storage	1400
3	Back up Storage	450
	<b>Total</b>	<b>2300</b>

**Note:**

- Bidder shall carry out the storage requirement estimation and supply as per the solution proposed, if the estimation is more than above specified. They may also refer the bandwidth estimation and storage functional requirements as provided in this Volume.
- Bidder may supply the storage in modular manner during the implementation (i.e. initially to cater to Phase I cameras, then to further phases & then entire city requirement).

#### **6.10.10. Storage Specifications**

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#	Parameter	Minimum Specifications	Bidder Compliance (Yes/No)	Product Documentation Reference
1.	<b>Make</b>	<to be provided by the bidder>		
2.	<b>Model</b>	<to be provided by the bidder>		
3.	Solution/ Type	<ul style="list-style-type: none"> <li>• IP Based/iSCSI/FC/NFS/ CIFS</li> <li>• If bidder is offering FCoE based solution, corresponding ports must be present in server as well as storage controller.</li> </ul>		
4.	Storage	<ul style="list-style-type: none"> <li>• Storage Capacity should be as per Overall Solution Requirement (usable, after configuring in offered RAID configuration)</li> <li>• RAID solution offered must protect against double disc failure.</li> <li>• Disks should be preferably minimum of 1.2 TB capacity for SSD / SAS and 3 TB for SATA/ NL-SAS (combination as per performance and SLA requirements of overall solution)</li> <li>• To store all types of data (Data, Voice, Images, Video, etc.)</li> <li>• Proposed Storage System should be scalable (vertically/horizontally)</li> </ul>		

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#	Parameter	Minimum Specifications	Bidder Compliance (Yes/No)	Product Documentation Reference
5.	Hardware Platform	<ul style="list-style-type: none"> <li>• Rack mounted form-factor</li> <li>• Modular design to support controllers and disk drives expansion</li> </ul>		
6.	Controllers	<ul style="list-style-type: none"> <li>• At least 2 Controllers in active/active mode</li> <li>• The controllers / Storage nodes should be upgradable seamlessly, without any disruptions / downtime to production workflow for performance, capacity enhancement and software / firmware upgrades.</li> </ul>		
7.	RAID support	<ul style="list-style-type: none"> <li>• Should support various RAID Levels</li> </ul>		
8.	Cache	<ul style="list-style-type: none"> <li>• Minimum 64 GB of useable cache across all controllers. If cache is provided in additional hardware for the storage solution, then cache must be over and above 64 GB.</li> </ul>		
9.	Redundancy and High Availability	<ul style="list-style-type: none"> <li>• The Storage System should be able to protect the data against single point of failure with respect to hard disks, connectivity interfaces, fans and power supplies</li> </ul>		

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#	Parameter	Minimum Specifications	Bidder Compliance (Yes/No)	Product Documentation Reference
10.	Management software	<ul style="list-style-type: none"> <li>• All the necessary software (GUI Based) to configure and manage the storage space, RAID configuration, logical drives allocation, snapshots etc. are to be provided for the entire system proposed.</li> <li>• Licenses for the storage management software should include disc capacity/count of the complete solution and any additional disks to be plugged in in the future, up to max capacity of the existing controller/units.</li> <li>• A single command console for entire storage system.</li> <li>• Should also include storage performance monitoring and management software</li> <li>• Should provide the functionality of proactive monitoring of Disk drive and Storage system for all possible disk failures</li> <li>• Should be able to take "snapshots" of the stored data to another logical drive for backup purposes</li> </ul>		

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#	Parameter	Minimum Specifications	Bidder Compliance (Yes/No)	Product Documentation Reference
11.	Data Protection	The storage array must have complete cache protection mechanism either by de-staging data to disk or providing complete cache data protection with battery backup to meet the SLAs		

**6.10.11. Secondary Storage**

#	Parameter	Minimum Specifications	Bidder Compliance (Yes/No)	Product Documentation Reference
1	Make	<to be provided by the bidder>		
2	Model	<to be provided by the bidder>		
3	Solution/Type	<ul style="list-style-type: none"> <li>Secondary Storage (Archival/Backup) can be on any media such as Disks, Disk systems, etc. or its combination along with all associate software. (so as to arrive at lower cost per TB)</li> <li>Minimum <b>1900</b> TB usable as secondary storage</li> <li>May or may not use de-duplication technology</li> <li>Compatible with primary storage</li> <li>Must use latest stable technology platform, with support available for next 5 years.</li> </ul>		

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#	Parameter	Minimum Specifications	Bidder Compliance (Yes/No)	Product Documentation Reference
4	Backup Size	To store data as required, to meet the archival requirement for different type of data/information <ul style="list-style-type: none"> <li>• 23 days of storage for surveillance camera feeds</li> <li>• 83 days of storage for traffic enforcement systems</li> <li>• 275 days of storage for ATCS systems</li> </ul>		
5	Hardware Platform	<ul style="list-style-type: none"> <li>• Rack mounted,</li> <li>• Rack based Expansion shelves</li> </ul>		
6	Software Platform	Must include backup/archive application portfolio required		
7	Retrieval time	Retrieval time for any data stored on secondary storage should be max. 4 hours for critical data & 8 hours for other data. This would be taken into account for SLA calculation. (Critical data means any data needing urgent attention by the Judicial System or by Police Dept. for investigation / terrorist treat perception).		

**6.10.12. Fire proof enclosure**

The overall design of the safe should be suitable for safe storage of computer diskettes, tapes, smart cards and similar devices and other magnetic media, paper documents, etc. the safe should have adequate fire protection.

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#	Parameters	Minimum Specifications	Bidder Compliance (Yes/No)	Product Documentation Reference
1	<b>Make</b>		<to be provided by the bidder>	
2	<b>Model</b>		<to be provided by the bidder>	
3	Capacity	<b>300 Litres</b>		
4	Temperature to Withstand	1000° C for at least 1 hour		
5	Internal Temperature	30° C after exposure to high temperature For 1 hour		
6	Locking	2 IO-lever high security cylindrical / Electronic lock		

**6.10.13. KVM Module**

#	Parameters	Minimum Specifications	Bidder Compliance (Yes/No)	Product Documentation Reference
1.	<b>Make</b>		<to be provided by the bidder>	
2.	<b>Model</b>		<to be provided by the bidder>	
3.	KVM Requirement	Keyboard, Video Display Unit and Mouse Unit (KVM) for the IT Infrastructure Management at Data Center		
4.	Form Factor	19" rack mountable		
5.	Ports	minimum 8 ports		
6.	Server Connections	USB or KVM over IP.		
7.	Auto-Scan	It should be capable to auto scan servers		
8.	Rack Access	It should support local user port for rack access		
9.	SNMP	The KVM switch should be SNMP enabled. It should be operable from remote locations		
10.	OS Support	It should support multiple operating system		

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#	Parameters	Minimum Specifications	Bidder Compliance (Yes/No)	Product Documentation Reference
11.	Power Supply	It should have dual power with failover and built-in surge protection		
12.	Multi-User support	It should support multi-user access and collaboration		

**6.10.14. Server/Networking rack specifications**

#	Parameter	Minimum Specifications	Bidder Compliance (Yes/No)	Product Documentation Reference
1.	<b>Make</b>		<to be provided by the bidder>	
2.	<b>Model</b>		<to be provided by the bidder>	
3.	Type	<ul style="list-style-type: none"> <li>19" 42U racks mounted on the floor</li> <li>Floor Standing Server Rack - 42U with Heavy Duty Extruded Aluminum Frame for rigidity. Top cover with FHU provision. Top &amp; Bottom cover with cable entry gland plates. Heavy Duty Top and Bottom frame of MS. Two pairs of 19" mounting angles with 'U' marking. Depth support channels - 3 pairs with an overall weight carrying Capacity of 500Kgs.</li> <li>All racks should have mounting hardware 2 Packs, Blanking Panel.</li> </ul>		



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#	Parameter	Minimum Specifications	Bidder Compliance (Yes/No)	Product Documentation Reference
		<ul style="list-style-type: none"> <li>Stationery Shelf (2 sets per Rack)</li> <li>All racks must be lockable on all sides with unique key for each rack</li> <li>Racks should have Rear Cable Management channels, Roof and base cable access</li> </ul>		
4.	Wire managers	Two vertical and four horizontal		
5.	Power Distribution Units	<ul style="list-style-type: none"> <li>2 per rack</li> <li>Power Distribution Unit - Vertically Mounted, 32AMPs with 25 Power Outputs. (20 Power outs of IEC 320 C13 Sockets &amp; 5 Power outs of 5/15 Amp Sockets), Electronically controlled circuits for Surge &amp; Spike protection, LED readout for the total current being drawn from the channel, 32AMPS MCB, 5 KV AC isolated input to Ground &amp; Output to Ground</li> </ul>		
6.	Doors	<ul style="list-style-type: none"> <li>The racks must have steel (solid / grill / mesh) front / rear doors and side</li> </ul>		

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#	Parameter	Minimum Specifications	Bidder Compliance (Yes/No)	Product Documentation Reference
		<p>panels. Racks should NOT have glass doors / panels.</p> <ul style="list-style-type: none"> <li>• Front and Back doors should be perforated with at least 63% or higher perforations.</li> <li>• Both the front and rear doors should be designed with quick release hinges allowing for quick and easy detachment without the use of tools.</li> </ul>		
7.	Fans and Fan Tray	<ul style="list-style-type: none"> <li>• Fan 90CFM 230V AC, 4" dia (4 Nos. per Rack)</li> <li>• Fan Housing Unit 4 Fan Position (Top Mounted) (1 no. per Rack) - Monitored - Thermostat based - The Fans should switch on based on the Temperature within the rack. The temperature setting should be factory settable. This unit should also include - humidity &amp; temperature sensor</li> </ul>		
8.	Metal	Aluminum extruded profile		
9.	Side Panel	Detachable side panels (set of 2 per Rack)		

#### **6.10.15. Enterprise Management Systems (EMS)**

To ensure that ICT systems are delivered at the performance level envisaged, it is important that an effective monitoring and management system be put in place. It is thus proposed that a proven Enterprise Management System (EMS) is proposed by the bidder for efficient management of the system, reporting, SLA monitoring and resolution of issues. Various key components of the EMS to be implemented as part of this engagement are –

1. Network Monitoring System
2. Server Monitoring System
3. Helpdesk System

The solution should provide a unified web based console which allows role based access to the users.

##### **1. Network Management System**

Solution should provide fault & performance management of the server side infrastructure and should monitor IP\SNMP enabled devices like Routers, Switches, Sensors, etc. Proposed Network Management shall also help monitor key KPI metrics like availability, in order to measure SLA's. Following are key functionalities that are required which shall assist administrators to monitor network faults & performance degradations in order to reduce downtimes, increase availability and take proactive actions to remediate & restore network services.

#	Minimum Specifications	Bidder Compliance (Yes/No)	Product Documentation Reference
1	<b>Make</b>		<to be provided by the bidder>
2	<b>Model</b>		<to be provided by the bidder>
3	The proposed solution must automatically discover manageable elements connected to the infrastructure and map the connectivity between them. Solution should provide centralized monitoring console displaying network topology map.		
4	Proposed solution should provide customizable reporting interface to create custom reports for collected data		
5	The system must use advanced root-cause analysis techniques and policy-based condition		

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#	Minimum Specifications	Bidder Compliance (Yes/No)	Product Documentation Reference
	correlation technology (at network level) for comprehensive analysis of infrastructure faults.		
6	The system should be able to clearly identify configuration changes and administrators should receive an alert in such cases.		
7	The solution should support multicast protocols too, if the overall project solution offered includes multicast.		

**Server Performance Monitoring System**

#	Minimum Specifications	Bidder Compliance (Yes/No)	Product Documentation Reference
1	<b>Make</b>		<to be provided by the bidder>
2	<b>Model</b>		<to be provided by the bidder>
3	The proposed tool should integrate with network performance management system and support operating system monitoring for various platforms supplied as part of this Project.		
4	The proposed tool must provide information about availability and performance for target server nodes.		
5	The proposed tool should be able to monitor various operating system parameters such as processors, memory, files, processes, file systems, etc. where applicable.		
6	If the offered server/computing solution includes virtualization,		

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#	Minimum Specifications	Bidder Compliance (Yes/No)	Product Documentation Reference
	then the server performance monitoring solution must include virtualization monitoring capabilities.		

**Centralized Helpdesk System**

#	Minimum Specifications	Bidder Compliance (Yes/No)	Product Documentation Reference
<b>1</b>	<b>Make</b>	<to be provided by the bidder>	
<b>2</b>	<b>Model</b>	<to be provided by the bidder>	
<b>3</b>	Helpdesk system should provide incident management, problem management templates along with helpdesk SLA system for tracking SLA's pertaining to incident resolution time for priority / non-priority incidents.		
<b>4</b>	System should also automatically create tickets based on alarm type		
<b>5</b>	The proposed helpdesk solution must provide flexibility of logging, viewing, updating and closing incident via web interface for issues related to the project.		
<b>6</b>	IT Asset database should be built and managed by the bidder, in order to carry out the scope of work items.		

**6.10.16. Centralized Anti-virus Solution**

The following features are required for centralized anti-virus solution, to protect all computing resources (servers, desktops, other edge level devices, etc.) :

- 1) Ability to scan through all file types and various compression formats. Ability to scan for HTML, VBScript Viruses, malicious applets and ActiveX controls.
- 2) Must update itself over internet for virus definitions, program updates etc. (periodically as well as in push-updates in case of outbreaks)

- 3) Able to perform different scan Actions based on the virus type (Trojan/ Worm, Joke, Hoax, Virus, other)
- 4) Shall provide Real-time product Performance Monitor and Built-in Debug and Diagnostic tools, and context- sensitive help.
- 5) The solution must provide protection to multiple remote clients
- 6) Shall provide for virus notification options for Virus Outbreak Alert and other configurable Conditional Notification.
- 7) Should be capable of providing multiple layers of defense
- 8) Shall have facility to clean, delete and quarantine the virus affected files.
- 9) Should support online update, where by most product updates and patches can be performed without bringing messaging server off-line.
- 10) Should support in-memory scanning so as to minimize Disk IO.
- 11) Should support Multi-threaded scanning
- 12) Should support scanning of nested compressed files
- 13) Should support heuristic scanning to allow rule-based detection of unknown viruses
- 14) All binaries from the MSI that are downloaded and distributed must be signed and the signature verified during runtime for enhanced security.

#### **6.10.17. Database Licenses**

Bidder needs to provide Licensed RDBMS, enterprise/full version as required for the proposed Surveillance System and following all standard industry norms for performance, data security, authentication and database shall be exportable in to XML.

#### **6.10.18. Backup Software**

1. The software shall be primarily used to back up the necessary and relevant video feeds from storage that are marked or flagged by the Police. The other data that would require backing up would include the various databases that shall be created for the surveillance system. Details of data that would be created are available in the table at section 'Data Requirements'
2. Scheduled unattended backup using policy-based management for all Server and OS platforms
3. The software should support on-line backup and restore of various applications and Databases
4. The backup software should be capable of having multiple back-up sessions simultaneously
5. The backup software should support different types of backup such as Full back up, Incremental back up, Differential back up, Selective back up, Point in Time back up and Progressive Incremental back up and snapshots
- The backup software should support different types of user interface such as GUI, Web-based interface

#### **6.10.19. Directory services**

1. Should be compliant with LDAP v3
2. Support for integrated LDAP compliant directory services to record information for users and system resources
3. Should provide authentication mechanism across different client devices / PCs
4. Should provide support for Group policies and software restriction policies
5. Should support security features, such as Kerberos, Smart Cards, Public Key Infrastructure (PKI), etc.
6. Should provide support for X.500 naming standards
7. Should support that password reset capabilities for a given group or groups of users can be delegated to any nominated user
8. Should support that user account creation/deletion rights within a group or groups can be delegated to any nominated user
9. Should support directory services integrated DNS zones for ease of management and administration/replication.

#### **6.10.20. Layer 3 Gigabit Manageable Switch**

#	Parameter	Minimum Specifications	Bidder Compliance (Yes/No)	Product Documentation Reference
1.	<b>Make</b>		<to be provided by the bidder>	
2.	<b>Model</b>		<to be provided by the bidder>	
3.	Ports	<ul style="list-style-type: none"> <li>• 24 or 48 (as per requirements) 10/100/1000 Base-TX Ethernet ports and extra 2 nos of 10G ports loaded with required SFP+ modules</li> <li>• All ports can auto-negotiate between 10Mbps/ 100Mbps/ 1000Mbps, half-duplex or full duplex and flow control for half-duplex ports.</li> </ul>		
4.	Switch type	Layer 3		
5.	MAC	As per solution design. However, the bidder to provision minimum 50%		

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#	Parameter	Minimum Specifications	Bidder Compliance (Yes/No)	Product Documentation Reference
		higher capacity on Day 1 for future requirements		
6.	Backplane	As per solution design. However, the bidder to provision minimum 50% higher capacity on Day 1 for future requirements		
7.	Forwarding rate	As per solution design. However, the bidder to provision minimum 50% higher capacity on Day 1 for future requirements		
8.	Port Features	Must support Port Mirroring, Port Trunking and 802.3ad LACP Link Aggregation port trunks		
9.	Flow Control	Support IEEE 802.3x flow control for full-duplex mode ports.		
10.	Protocols	<ul style="list-style-type: none"> <li>Support 802.1D, 802.1S, 802.1w, Rate limiting</li> <li>Support 802.1Q VLAN encapsulation, IGMP v1, v2 and v3 snooping</li> <li>802.1p Priority Queues, port mirroring, DiffServ</li> <li>Support based on 802.1p priority bits with at least 8 queues</li> <li>DHCP support &amp; DHCP snooping/relay/optional 82/ server support</li> <li>Shaped Round Robin (SRR) or WRR scheduling support.</li> <li>Support for Strict priority queuing &amp; Sflow</li> <li>Support for IPV6 ready features with dual stack, Support up to 255</li> </ul>		



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#	Parameter	Minimum Specifications	Bidder Compliance (Yes/No)	Product Documentation Reference
		VLANs and up to 4K VLAN IDs		
11.	Access Control	<ul style="list-style-type: none"> <li>• Support port security</li> <li>• Support 802.1x (Port based network access control).</li> <li>• Support for MAC filtering.</li> <li>• Should support TACACS+ and RADIUS authentication</li> </ul>		
12.	VLAN	<ul style="list-style-type: none"> <li>• Support 802.1Q Tagged VLAN and port based VLANs and Private VLAN</li> <li>• The switch must support dynamic VLAN Registration or equivalent</li> <li>• Dynamic Trunking protocol or equivalent</li> </ul>		
13.	Protocol and Traffic	<ul style="list-style-type: none"> <li>• Network Time Protocol or equivalent Simple Network Time Protocol support</li> <li>• Switch should support traffic segmentation</li> <li>• Traffic classification should be based on user-definable application types: TOS, DSCP, Port based, TCP/UDP port number</li> </ul>		
14.	Management	<ul style="list-style-type: none"> <li>• Switch needs to have console port for management via PC</li> <li>• Must have support SNMP v1,v2 and v3</li> </ul>		

#	Parameter	Minimum Specifications	Bidder Compliance (Yes/No)	Product Documentation Reference
		<ul style="list-style-type: none"> <li>Should support 4 groups of RMON</li> <li>Should have accessibility using Telnet, SSH, Console access, easier software upgrade through network using TFTP etc. Configuration management through CLI, GUI based software utility and using web interface</li> </ul>		

#### **6.10.21. Structured Cabling Components**

#	Parameter	Minimum Specifications	Bidder Compliance (Yes/No)
1.	Standards	ANSI TIA 568 C for all structured cabling components	
2.	OEM Warranty	OEM Certification and Warranty of 15-20 years as per OEM standards	
3.	Certification	UL Listed and Verified	

#### **6.10.22. Electrical cabling component**

#	Parameter	Minimum Specifications	Bidder Compliance (Yes/No)
1.	Standards	All electrical components shall be design manufactured and tested in accordance with relevant Indian standards IEC's	

### **6.11. Technical Specifications & Functional Specifications–Integrated Command and Control Center (ICCC) & Viewing Centers**

The functional requirements and technical specifications provided in the below sections and at other sections in this RFP are indicative and carry guiding rule. The MSI is free to offer products and solutions which meet requirements of the RFP focusing on the outcome, future scalability, security, reliability and adherence to specified SLA under this RFP, in line with applicable standards & best practices adopted in the industry. The MSI is encouraged to design an Optimized solution which is technically superior, innovative, proven, better in terms of functionality and is cost effective. Any specified parameters mentioned in the scope/technical requirement in the RFP may be considered

if it is required for meeting current & future requirements during the contract period. The MSI is fully responsible for the specified outcome to be achieved.

**6.11.1. Integrated Command and Control Center Application**

#	Parameters	Minimum Specifications	Bidder Compliance	Product Documentation Reference
1.	<b>Make</b>		<to be provided by the bidder>	
2.	<b>Model</b>		<to be provided by the bidder>	
3.	Solution & Platform	The Command & Control solution should be implemented and complied to the industry open standards based Commercial-of-the-shelf (COTS) products.		
4.		Must have built-in fault tolerance, load balancing and high availability & must be certified by the OEM.		
5.		Software (Application, Database and any other) must not be restricted by the license terms of the OEM from scaling out on unlimited number of cores and servers during future expansion.		
6.		System must provide a comprehensive API (Application Program Interface) or SDK (Software Development's Kit) to allow interfacing and integration with existing systems, and future application and sensors which shall be deployed on the field.		
7.		The solution should be network and protocol agonistic and provide option to connect legacy system through API's with either read, write or both options. It should connect diverse on premise and/or cloud platform's and make it easy to exchange data and services between them.		
8.		The system shall allow seamless integration with all of the department's existing and future		

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#	Parameters	Minimum Specifications	Bidder Compliance	Product Documentation Reference
		initiatives (as mentioned in Section 7.1.5)		
9.		The platform should be able to integrate with any type of sensor platform being used for the urban services irrespective of the technology used.		
10.		The platform should be able to normalize the data coming from different devices of same type (i.e. Different lighting sensor from different OEMs, different energy meters from different OEMs etc.) and provide secure access to that data using data API(s) to application developers		
11.	Convergence of Multiple feeds / services	System need to have provision that integrates various services and be able to monitor them and operate them. The solution should provide option to integrate existing deployed solution by City and also need to provide scalability option to implement new use cases. System should support DDE and OLE for integration with Process control systems and sensors System should have capability to source data from various systems implemented in Allahabad City to create actionable intelligence		
12.	Industry Standards for the Command & Control	The solution should adhere to the Industry standards for interoperability, data representation & exchange, aggregation, virtualization and flexibility		
13.	Center	IT Infrastructure Library (ITIL) standards for Standard Operations Plan & Resource Management		

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#	Parameters	Minimum Specifications	Bidder Compliance	Product Documentation Reference
14.		Geo Spatial Standards like GML & KML etc.		
15.		Business Process Model and Notation (BPMN) or equivalent for KPI Monitoring.		
16.	Command & Control Center Components	<ul style="list-style-type: none"> <li>Web server to manage client requests. Client should provide web-based, one-stop portals to event information, overall status, and details. The user interface (UI) to present customized information in various preconfigured views in common formats. All information to be displayed through easy-to-use dashboards.</li> </ul>		
17.		<ul style="list-style-type: none"> <li>Application server to provide a set of services for accessing and visualizing data. Should be able to import data from disparate external sources, such as databases and files. It should provide the contacts and instant messaging service to enable effective, real-time communication. It should provide business monitoring service to monitor incoming data records to generate key performance indicators. It should also provide the users to view key performance indicators, standard operating procedures, notifications, and reports, spatial-temporal data on a geospatial map, or view specific details that represent a city road, building or an area either on a location map, or in a</li> </ul>		

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#	Parameters	Minimum Specifications	Bidder Compliance	Product Documentation Reference
		<p>list view. The application server should provide security services that ensure only authorized users and groups can access data.</p> <ul style="list-style-type: none"> <li>• System Platform – The platform should provide a common data integration layer which can collect and contextualize information from disparate data sources regardless of protocol. The platform should support templatization to allow “build once-deploy everywhere” functionality.</li> <li>• Workflow and Incidents Lifecycle engine – This function should allow users to define and modify new workflows. The workflow could cut across multiple systems via the interfacing modules. Workflow for operational alerts and escalations should be triggered automatically without human intervention. Workflow approvals should have facility to approve from any device with e-signature. This function should provide facility to trigger a corrective action workflow and define the stakeholders for the same. Should manage the life cycle of incidents and related entities via pre-define workflows. The workflow could cut across multiple systems via the interfacing modules. Workflow</li> </ul>		

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#	Parameters	Minimum Specifications	Bidder Compliance	Product Documentation Reference
		<p>for operational alerts and escalations should be triggered automatically without human intervention.</p> <ul style="list-style-type: none"> <li>Incidents Planning – should manage the planning preparations of an incident including resource allocation, tasks management etc.</li> <li>Analytics and MIS – should provide users with business analytics reporting and tools to organize, evaluate and efficiently perform day to day operations</li> <li>Security &amp; Roles – should manage roles definition for internal as well as external access</li> <li>Centralized data archiving for operational data : Should provide facility for centralized storage of operational data ( time-series or transactional) with high granularity and data compression capability</li> <li>Mobility: should enable app-based access to monitor alerts, KPI ,KOPs, SOPs and reports to mobile users. Should support popularly user’s smartphone /tablets. App content should be presented in context to the user role.</li> </ul>		
<b>18.</b>	Incident Management Requirements	The system must provide Incident Management Services to facilitate the management of response and recovery operations:		
<b>19.</b>		Should support comprehensive reporting on event status in real time		

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		manually or automatically by a sensor/CCTV video feeds.		
20.		Should support for sudden critical events and linkage to standard operating procedures automatically without human intervention.		
21.		Should support for multiple incidents with both segregated and/or overlapping management and response teams.		
22.		Should support Geospatial rendering of event and incident information.		
23.		Should support plotting of area of impact using polynomial lines to divide the area into multiple zones on the GIS maps.		
24.		Should support incorporation of resource database for mobilizing the resources for response.		
25.		Should provide facility to capture critical information such as location, name, status, time of the incident and be modifiable in real time by multiple authors with role associated permissions (read, write). Incidents should be captured in standard formats to facilitate incident correlation and reporting.		
26.		The system must identify and track status of critical infrastructure / resources and provide a status overview of facilities and systems		
27.		Should provide detailed reports and summary views to multiple users based on their roles.		
28.		A Reference Section in the tool must be provided for posting, updating and disseminating plans, procedures, checklists and other related information.		



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#	Parameters	Minimum Specifications	Bidder Compliance	Product Documentation Reference
29.		Provide User-defined forms as well as Standard Incident Command Forms for incident management.		
30.	Integrated User Specific & Customizable Dashboard	Should provide integrated dashboard with an easy to navigate user interface for managing profiles, groups, message templates, communications, tracking receipts and compliance		
31.		<ul style="list-style-type: none"> <li>Collects major information from other integrated City sensors/platforms.</li> <li>Should allow different inputs beyond cameras, such as, PC screen, web page, and other external devices for rich screen layout</li> <li>Multi-displays configurations</li> <li>Use of, GIS tool which allows easy map editing for wide area monitoring (Google map, Bing map, ESRI Arc GIS map, etc.).</li> </ul>		
32.		Should provide tools to assemble personalized dashboard views of information pertinent to incidents, emergencies & operations of command center		
33.		Should provide historical reports, event data & activity log. The reports can be exported to pdf or html formats.		
34.		Should provide dashboard filtering capabilities that enable end-users to dynamically filter the data in their dashboard based upon criteria, such as region, dates, product, brands, etc. and capability to drill down to the details		
35.	Integration with Social Media &	Should provide integration of the Incident Management application with the social media. Should Provide		

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#	Parameters	Minimum Specifications	Bidder Compliance	Product Documentation Reference
	Open Source Intelligence	analytics based on the social media feed collected from the open source intelligence and collate with the surveillance inputs to alert the responders for immediate action on the ground.		
36.		Should extract messages and display it in an operational dashboard.		
37.		Should be able to correlate the extracted message from the social media with existing other events and then should be able to initiate an SOP.		
38.		Should be able to identify the critical information and should be able to link it to an existing SOP or a new SOP should be started.		
39.		Should provide notifications to multiple agencies and departments (on mobile) that a new intelligence has been gathered through open source/social media.		
40.	Device Status, Obstruction	Should provide icon based user interface on the GIS map to report non-functional device.		
41.	Detection and Availability	Should also provide a single tabular view to list all devices along with their availability status in real time.		
42.	Notification	Should provide User Interface to publish messages to multiple devices at the same time.		
43.	Event Correlation	Command & Control Center should be able to correlate two or more events coming from different subsystems (incoming sensors) based on time, place, custom attribute and provide correlation notifications to the operators based on predefined business and operational rules in the configurable and customizable rule engine.		

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#	Parameters	Minimum Specifications	Bidder Compliance	Product Documentation Reference
44.	Standard Operations Procedures (SOP)	Command & Control Center should provide for authoring and invoking un-limited number of configurable and customizable standard operating procedures through graphical, easy to use tooling interface.		
45.		Standard Operating Procedures should be established, approved sets of actions considered to be the best practices for responding to a situation or carrying out an operation.		
46.		The users should be able to edit the SOP, including adding, editing, or deleting the activities.		
47.		The users should be able to also add comments to or stop the SOP (prior to completion).		
48.		There should be provision for automatically logging the actions, changes, and commentary for the SOP and its activities, so that an electronic record is available for after-action review.		
49.		The SOP Tool should have capability to define the following activity types:		
50.		<b>Manual Activity</b> - An activity that is done manually by the owner and provide details in the description field.		
51.		<b>Automation Activity</b> - An activity that initiates and tracks a particular work order and select a predefined work order from the list.		
52.		<b>If-Then-Else Activity</b> - A conditional activity that allows branching based on specific criteria. Either enter or select values for Then and Else.		
53.		<b>Notification Activity</b> - An activity that displays a notification window that contains an email template for the		

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#	Parameters	Minimum Specifications	Bidder Compliance	Product Documentation Reference
		activity owner to complete, and then sends an email notification.		
54.		<b>SOP Activity</b> - An activity that launches another standard operating procedure.		
55.	Key Performance Indicator	Command & Control Center should be able to facilitate measurement or criteria to assay the condition or performance of departmental processes & policies.		
56.		<b>Green</b> indicates that the status is acceptable, based on the parameters for that KPI, no action is required.		
57.		<b>Yellow</b> indicates that caution or monitoring is required, action may be required.		
58.		<b>Red</b> indicates that the status is critical and action is recommended.		
59.	Reporting Requirements	Command & Control Center should provide easy to use user interfaces for operators such as Click to Action, Charting, Hover and Pop Ups, KPIs, Event Filtering, Drill down capability, Event Capture and User Specific Setup		
60.		The solution should generate Customized reports based on the area, sensor type or periodic or any other customer reports as per choice of the administrators		
61.	Collaboration Tools	Should provide tools for users to collaborate & communicate in real-time using instant messaging features.		
62.	Communication	The solution should adhere to the below mentioned communication requirements.		

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#	Parameters	Minimum Specifications	Bidder Compliance	Product Documentation Reference
63.	Requirements	Provide the ability to search/locate resources based on name, department, role, geography, skill etc. for rapidly assembling a team, across department, divisions and agency boundaries, during emergency		
64.		Provide the capability to Invite - Using information provided during the location of those individuals or roles, invite them to collaborate and to share valuable information.		
65.		Provide a single web based dashboard to send notifications to target audiences using multiple communication methods including voice-based notification on PSTN/Cellular, SMS, Voice mail, E-mail and Social Media		
66.		The solution should provide Dispatch Console integrates with various communication channels. It should provide rich media support for incidents, giving dispatchers the power to consolidate information relating to an incident and instantly share that information among responder teams. It should assess the common operating picture, identify & dispatch mobile resources available nearby the incident location. Augment resources from multiple agencies for coordinated response.		
67.	Authentication	Use authentication information to authenticate individuals and/or assign roles.		
68.	Instant messaging	Provide ability to converse virtually through the exchange of text, audio, and/or video based information in real time with one or more individuals		

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#	Parameters	Minimum Specifications	Bidder Compliance	Product Documentation Reference
		within the emergency management community.		
69.	Events and Directives control	Should provide the capability for the events that are produced from a sub-system and are forwarded to the Command & Control Center. Events could be a single system occurrence or complex events that are correlated from multiple systems. Events could be ad hoc, real-time, or predicted and could range in severity from informational to critical. At the Command & Control Center, the event should be displayed on an operations dashboard and analyzed to determine a proper directive.		
70.		Directives issued by the Command & Control Center should depend on the severity of the monitored event. Directives shall be designed and modified based on standard operating procedures, as well as state legislation. A directive could be issued automatically via rules, or it could be created by the operations team manually.		
71.	What-if Analysis Tool	The solution should provide the capability to manage the emergencies and in-turn reducing risks, salvaging resources to minimize damages and recovering the assets that can speed up recovery.		
72.		To take proactive decisions that help minimize risks and damages, the solution should provide Analytical and Simulation systems as part of the Decision Support System. The solution should help simulate what if scenarios. It should help visualize		

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#	Parameters	Minimum Specifications	Bidder Compliance	Product Documentation Reference
		assets/resources at risk due to the pending/ongoing incident, should render impacted region on a GIS/3D map. The solution should help build the list of assets, their properties, location and their interdependence through an easy to use Graphical User Interface. When in What if Analysis mode the solution should highlight not only the primary asset impacted but also highlight the linked assets which shall be impacted. The user should be able to run the What-if Analysis mode for multiple types of emergency events such as Bomb Blast, Weather events, Accidents etc.		
73.	Resource & Route Optimization	The system should provide the software component for the message broadcast and notification solution that allows authorized personal and/or business processes to send large number of messages to target audience (select-call or global or activation of pre-programmed list) using multiple communication methods including SMS, Voice (PSTN/Cellular), Email and Social Media.		
74.	Alert & Mass Notification Requirements	Provide a single web based dashboard to send notifications to target audiences using multiple communication methods including voice-based notification on PSTN/Cellular, SMS, Pager, Voice mail, E-mail and Social Media		
75.		Provide function for creating the alert content and disseminating to end users. Provision of alerting external broadcasting organizations like Radio, TV, Cellular, etc., as web-service.		

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#	Parameters	Minimum Specifications	Bidder Compliance	Product Documentation Reference
76.		Provide Role based security model with Single-Sign-On to allow only authorized users to access and administer the alert and notification system.		
77.	Security & Access Control	Provide comprehensive protection of web content and applications on back-end application servers, by performing authentication, credential creation and authorization.		
78.	Internet Security	Comprehensive policy-based security administration to provide all users specific access based on user's responsibilities. Maintenance of authorization policy in a central repository for administration purposes.		
79.	Authorization	Should support to enable assignment of permissions to groups, and administration of access control across multiple applications and resources. Secure, web-based administration tools to manage users, groups, permissions and policies remotely		
80.	User group	Provide policies using separate dimensions of authorization criteria like Traditional static Access Control Lists that describe the principals (users and groups) access to resource and the permissions each of these principals possess.		
81.	Provide multi-dimensional access control	SSO to Web-based applications that can span multiple sites or domains with a range of SSO options.		
82.	Flexible single sign-on (SSO)	Support LDAP authentication mechanism		



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#	Parameters	Minimum Specifications	Bidder Compliance	Product Documentation Reference
83.	Authentication	Should have ability to respond to real-time data with intelligent & automated decisions		
84.	Rule Engine & Optimization	Should provide an environment for designing, developing, and deploying business rule applications and event applications.		
85.		The ability to deal with change in operational systems is directly related to the decisions that operators are able to make		
86.		Should have at-least two complementary decision management strategies: business rules and event rules.		
87.	Situational Awareness COP (Common Operational Picture)	<ul style="list-style-type: none"> <li>The ICCC Application should be able to combine data from various sources and present it as different views tailored to different operator's needs.</li> <li>The ICCC Application should automatically update the information based on alarms and incidents that are presented to it via the business rules engine. The polling and ICCC Application database refresh cycle shall be configurable to match the status of the situation (whether there is an emergency or crisis or just monitoring only).</li> <li>Common Operational Picture should comprise of a comprehensive view of the incident or a group of related incidents as on a specific date and time which should include but not be limited to the following:</li> </ul>		

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#	Parameters	Minimum Specifications	Bidder Compliance	Product Documentation Reference
		<ul style="list-style-type: none"> <li>○ Tasks assignment and their status</li> <li>○ Agencies involved</li> <li>○ Resources deployed</li> <li>○ Incident status across relevant parameters of the incident e.g. household affected by a transformer shut down</li> <li>○ Timeline view of the situation</li> </ul> <p>Suggested actions from the system with their status</p>		
88.	Task Management	<ul style="list-style-type: none"> <li>• The system should be able to create, assign, track and report on the lifecycle of tasks during a particular incident.</li> <li>• The system should allow a particular task to be decomposed into sub-tasks.</li> <li>• The system should provide an easy to interpret management dashboard view of the progress of all tasks during an incident.</li> <li>• The system should be able to organise the visual representation of tasks into prioritized list, filtered list, as well as colour coded representation for ease of understanding.</li> <li>• The system should be able to perform the following functions around task management: <ul style="list-style-type: none"> <li>○ Create a task with unique ID. (Subtasks shall follow parent ID</li> </ul> </li> </ul>		

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#	Parameters	Minimum Specifications	Bidder Compliance	Product Documentation Reference
		<p>with second level numbering).</p> <ul style="list-style-type: none"> <li>○ Assign a target completion date and time for the task, either directly or as a time-span from the task's creation.</li> <li>○ Date and time stamp of the creation of the task.</li> <li>○ Log and track status of tasks. System should provide capability to define status of tasks during its lifecycle. These status definitions could be mapped to other task attributes such as the task type.</li> <li>○ Key-word search against task list.</li> </ul> <ul style="list-style-type: none"> <li>• The above attributes shall be colour coded.</li> <li>• The system shall allow the tasks to be filtered on the real-time dashboard by agency then by task status. This filtering should allow an operator to filter for all tasks of a particular state or a combination of state; and by the time remaining until (or time elapsed since) the target completion time.</li> <li>• The system should allow multiple individual workstations to select specific agencies of interest on each workstation simultaneously.</li> </ul>		

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#	Parameters	Minimum Specifications	Bidder Compliance	Product Documentation Reference
		<ul style="list-style-type: none"> <li>The system should allow the ASCL to display all agencies' tasks simultaneously as well.</li> <li>The tasks should be displayed on a real-time timeline.</li> </ul> <p><b>The criticality of tasks should be dynamically changed depending on the performance of the incident response.</b></p>		
89.	Timeline and Charting	<ul style="list-style-type: none"> <li>The system should provide a facility to see incidents and actions (tasks) added to the ICCC Application in a tabular list form as well as GANTT chart format filtered by day, week, month, year or any specific date range.</li> <li>The system should provide a facility to see incidents, actions and interdependencies between actions in a clear visual graphical manner.</li> <li>The system should be able to filter the information based on at least the following parameters: <ul style="list-style-type: none"> <li>Incident information</li> <li>Resources information</li> <li>Agency type</li> <li>Tasks</li> <li>Criticality or priority</li> </ul> </li> </ul>		
90.	GIS Display	<ul style="list-style-type: none"> <li>Shall view the environment through geospatial or fixed composite computer-generated (JPEG, BMP, AutoCAD, etc.) map</li> </ul>		

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#	Parameters	Minimum Specifications	Bidder Compliance	Product Documentation Reference
		<ul style="list-style-type: none"> <li>• Should allow user to view sensor and related name from the displayed map</li> <li>• Should allow all resources, objects, sensors and elements on the map to be geo-referenced such that they have a real world coordinate.</li> <li>• Should visually display a camera sensor with related camera orientation, camera range and camera field of view angle.</li> <li>• Should visually display an alarming sensor on map</li> <li>• Should visually differentiate sensor alarm severities on map through different color and icon identifiers</li> <li>• Should immediately view alarm details (including description, video, etc.) and investigate the alarm from the map</li> <li>• Should allow user to choose camera and other sensors from map to view live video and the data</li> <li>• Should allow user to choose camera and take live video image snapshot and save to file from any camera</li> <li>• Should allow user to choose camera from map to move PTZ cameras</li> <li>• Should allow user to choose camera to play, pause, stop, fast-forward, rewind, and play recorded video from preset time</li> </ul>		

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#	Parameters	Minimum Specifications	Bidder Compliance	Product Documentation Reference
		<ul style="list-style-type: none"> <li>• Should allow user to choose camera and take recorded video image snapshot and save to file or print from any live or recorded video</li> <li>• Should allow user to jump from one map to the next with a single click of a mouse with map links</li> <li>• Should allow map information “layers” to be displayed/hidden on items such as – <ul style="list-style-type: none"> <li>○ Sensor names</li> <li>○ Sensors</li> <li>○ Sensor range (e.g. camera – orientation, range, field of view angle) <ul style="list-style-type: none"> <li>○ Locations and zones</li> <li>○ Perimeter ranges</li> <li>○ Resource tracks</li> </ul> </li> </ul> </li> </ul> <p>Allow user to zoom in/out on different regions of map graphic</p>		
91.	Video Display	<ul style="list-style-type: none"> <li>• Shall view live or recorded video from resizable and movable windows</li> <li>• Should have an ability to perform video controls for video systems from workstation</li> <li>• Shall play, fast-forward, rewind, pause, and specify time to play recorded video</li> <li>• Shall take a video still image (snapshot) from live or recorded video</li> <li>• Shall export video for user specified time and duration</li> </ul>		

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#	Parameters	Minimum Specifications	Bidder Compliance	Product Documentation Reference
		<ul style="list-style-type: none"> <li>• Shall have the capability to move PTZ cameras</li> <li>• Shall view Video in Video Matrix</li> <li>• Shall display in 1x1, 2x2, 3x3 and 4x4 window formats</li> <li>• Shall enable operator to specify video windows to be displayed in matrix</li> <li>• Shall enable matrix settings to be saved per user</li> <li>• Shall view either live or recorded video can be displayed in the video matrix window.</li> <li>• Shall enable video snapshot to be taken and saved from any window pane in the matrix view</li> <li>• Shall rotate video in “virtual” video guard tour</li> <li>• Shall rotate through multiple video views based on predefined video camera sequence and duration.</li> <li>• Shall enable the user to pause the rotation of video and resume the video rotation again</li> <li>• Shall enable times between new video to be adjusted</li> <li>• Shall enable both live video and recorded video to be played through the video guard tour.</li> <li>• Shall enable alarms to be generated from any video pane</li> <li>• Shall enable user to only view and control video for which they have been assigned permissions by the administrator</li> <li>• Shall manually create an alarm from the live or recorded video</li> </ul>		

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#	Parameters	Minimum Specifications	Bidder Compliance	Product Documentation Reference
		with specified severity and description		
92.	Alarm Display	<ul style="list-style-type: none"> <li>• Should have an ability to display alarm condition through visual display and audible tone</li> <li>• Should have an ability to simultaneously handle multiple alarms from multiple workstations</li> <li>• Should have an ability to automatically prioritize and display multiple alarms and status conditions according to pre-defined parameters such as alarm type, location, sensor, severity, etc.</li> <li>• Should display the highest priority alarm and associated data / video in the queue as default, regardless of the arrival sequence</li> </ul>		
93.	Historical Alarm Handling	<ul style="list-style-type: none"> <li>• Should have an ability to view historical alarms details even after the alarm has been acknowledged or closed.</li> <li>• Should have an ability to sort alarms according to date/time, severity, type, and sensor ID or location.</li> </ul>		
94.	Alarm Reporting	<ul style="list-style-type: none"> <li>• Should have an ability to generate a full incident report of the alarm being generated.</li> <li>• Should have an ability to display report on monitor and print report</li> <li>• Should have details of alarm including <ul style="list-style-type: none"> <li>• severity, time/date, description and location</li> </ul> </li> </ul>		



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#	Parameters	Minimum Specifications	Bidder Compliance	Product Documentation Reference
		<ul style="list-style-type: none"> <li>• Captured video image snapshots</li> <li>• Relevant sensor data such as SCADA sensors</li> <li>• Response instructions</li> <li>• Alarm activities (audit trail)</li> <li>• Should have an ability to export alarm report in various formats including pdf, jpeg, html, txt, and mht formats</li> <li>• Should have an ability to generate an alarm incident package including the full incident report and exported sensor data from the incident in a specific folder location.</li> </ul>		
95.	Alarm Policies and Business Logic Administration	<ul style="list-style-type: none"> <li>• The ICCC Application solution should have the following ability to handle the workflow alarms through graphical user interface.</li> <li>• Should have an ability to match keywords or text from the alarming subsystem's incident description to raise an alarm using criteria including exact match, exact NOT match, contains match, wildcard match and regularly expression match (such as forced door alarm, denied access, door open too long, etc.)</li> <li>• Should have an ability to optionally match alarming subsystem's incident status, incident severity, and sensor type</li> <li>• Should have an ability to apply any alarm policy to one or more monitoring area(s) or zone(s) without having to reapplying the policy multiple times.</li> </ul>		

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#	Parameters	Minimum Specifications	Bidder Compliance	Product Documentation Reference
		<ul style="list-style-type: none"> <li>Should have an ability to apply any alarm policy to one or more sensors without having to reapply the policy multiple times.</li> <li>Should have an ability to assign specific actions for each alarm</li> <li>Should have an ability to activate or deactivate alarms as required</li> <li>Should have an ability to create exceptions</li> <li>Should Create batch-wise rules and process them</li> <li>Should Check and rectify logical errors and contradictory rules</li> <li>Should have an ability to schedule execution of rules</li> <li>Should Suspend or Terminate the application of rule</li> </ul> <p>Should archive unused or deactivated rules</p>		

**6.11.2. Contact Center**

#	Minimum Requirements	Bidder Compliance(Y es/No)	Product Documentation Reference
1	<b>Make</b>	<to be provided by the bidder>	
2	<b>Model</b>	<to be provided by the bidder>	
3	For up to 50 agents		
4	Automatic call distribution		
5	Automatic identification of incoming number based on landline and mobile number mapping		
6	Call recording mapped to incident tickets		
7	Customizable agent and supervisor desktop layout		
8	Inbound and outbound capability		

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#	Minimum Requirements	Bidder Compliance(Yes/No)	Product Documentation Reference
9	Call control		
10	Multisession web chat		
11	Email		
12	Live data reporting gadgets		
13	Phonebook		
14	Multiline support		
15	Speed dial in IP phones		

**6.11.3. IP Push to Talk (interpretability Communication Channel)**

#	Minimum Specifications	Bidder Compliance(Yes/No)	Product Documentation Reference
1	<b>Make</b>	<to be provided by the bidder>	
2	<b>Model</b>	<to be provided by the bidder>	
3	IP Push to Talk Radio: Instant communication to critical first responders via push to talk over IP. This shall enable All communication across various business sites.		
4	The radio over IP solution must integrate any analog or digital radio system, any to any Push To Talk (PTTT) communications.		
5	The system shall create virtual talk groups (VTGs) to facilitate Push-to-Talk (PTT) communications between users of multiple types and technologies of Land Mobile Radios with users of PCs, landline phones, cellular and android phones, and IP phones.		
6	The system shall provide a High Availability option of adding a secondary hot standby server to provide high availability with no single point of failure. If a primary server fails, the secondary server automatically takes over service without communication interruption		

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#	Minimum Specifications	Bidder Compliance(Yes/No)	Product Documentation Reference
7	The solution must send encrypted data for PTT communications.		
8	The system shall provide a web service API to integrate System with third party applications, such as Command and Control		
9	The system shall support role-based management to provide compartmentalized functions for personnel who need to perform different roles.		
10	System should be capable to the system shall provide an easy-to-use Web interface. Authorized personnel shall be able to access the System Server from any location by using a supported browser and a network connection		
11	Integrate with IP phones to talk to radio walkie talkies / Any other compatible Phone		
12	The system shall provide Loop Prevention: As multiple dispatchers patch channels together, there is always the possibility of creating a channel loop that causes audio feedback into the communication path. The system should automatically identify potential audio loops and resolve them before they become an issue		
13	The System Server shall provide an audit trail for analysis, critique, and operations management. Detailed activity logging shall allow administrators to determine which user actions were performed and when they were performed		

**6.11.4. Video Wall Screen**

#	Parameter	Minimum Specifications	Bidder Compliance (Yes/No)	Product Documentation Reference
1.	<b>Make</b>	<to be provided by the bidder>		
2.	<b>Model</b>	<to be provided by the bidder>		
3.	Technology	HD LED Display, Direct LED Backlight		

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#	Parameter	Minimum Specifications	Bidder Compliance (Yes/No)	Product Documentation Reference
4.	Screen Size	55"		
5.	Basel Size	1.2 mm (Top/Bottom), 2.3 mm (Left/right)		
6.	Resolution	Full high definition (1080p) 16:9 Widescreen		
7.	Contrast ratio	1400:1		
8.	Brightness	500 nit		
9.	Viewing angle	178 degree/178 degree (H/V)		
10.	Response time	12 ms		
11.	Input	HDMI and other inputs as per Video Wall solution offered		
12.	Control	- On Screen Display (OSD) - IR remote control		
13.	Operations	24 x 7		
14.	LED Lifespan	50000 hours (50% Brightness)		

**6.11.5. Video Wall Controller**

#	Parameter	Minimum Specifications	Bidder Compliance (Yes/No)	Product Documentation Reference
1.	Make	<to be provided by the bidder>		
2.	Model	<to be provided by the bidder>		
3.	Display controller	Controller to control Video wall in a matrix (4x2 output) as per requirement along with software		

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4.	Processor	Latest Generation 64 bit x86 Quad Core processor (3.4 Ghz) or Better		
5.	RAM	16 GB DDR3 ECC RAM		
6.	HDD	2x500 GB 7200 RPM HDD (Configured in RAID 0)		
7.	RAID	Should support all RAID levels		
8.	Networking	Dual-port Gigabit Ethernet Controller with RJ-45 ports		
9.	Accessories	104 key Keyboard and Optical USB mouse		
10.	USB Ports	Minimum 4 USB Ports		
11.	OS	* Supports 64-bit Operating Systems Windows 7		
12.	Power Supply	( 1+1) Redundant hot swappable		
13.	Chassis	19" Rack mount		
14.	Redundancy support	Power Supply, HDD, LAN port & Controller		
15.	Scalability	Display multiple source windows in any size, anywhere on the wall		
16.	Control functions	Brightness/ Contrast/ Saturation/ Hue/ Filtering/ Crop/ Rotate		
17.	System Reliability	Operating Temperature range : As per Allahabad weather conditions Humidity: : As per Allahabad weather conditions		
18.	Wall configuration	16 DVI-D Outputs		
19.	Universal Inputs	DVI/HDMI/USB/ LAN/ VGA/SATA port		
20.	Redundancy Support	Power Supply, HDD, LAN port & Controller		

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21.	Video Wall, Controller, Cube & wall management	Video Wall, Controller, Cube & Wall management software should preferably be from same OEM for ensuring smooth operations and seamless integration and feature enablement and enhancement. All licenses of the software supplied with Controller and Video Wall should be with perpetual license and cost of the same should be included in the quoted cost.		
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**6.11.6. Video Wall Management Software**

#	Parameter	Minimum Specifications	Bidder Compliance (Yes/No)	Product Documentation Reference
1	<b>Make</b>		<to be provided by the bidder>	
2	<b>Model</b>		<to be provided by the bidder>	
3	Display & Scaling	Display multiple sources anywhere on display up to any size		
4	Input Management	All input sources can be displayed on the video wall in freely resizable and movable windows		
5	Scenarios management	Save and Load desktop layouts from Local or remote machines		
6	Layout Management	Support all Layout from Input Sources, Internet Explorer, Desktop and Remote Desktop Application		
7	Multi View Option	Multiple view of portions or regions of Desktop, Multiple Application Can view from single desktop		

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#	Parameter	Minimum Specifications	Bidder Compliance (Yes/No)	Product Documentation Reference
8	Other features	SMTP support		
9		Remote Control over LAN		
10		Alarm management		
11		Remote management		
12		Multiple concurrent client		
13		KVM support		
14	Cube Management	Cube Health Monitoring		
15		Pop-Up Alert Service		
16		Graphical User Interface		

**6.11.7. Monitoring Workstations**

#	Parameter	Minimum Specifications	Bidder Compliance (Yes/No)	Product Documentation Reference
1.	<b>Make</b>		<to be provided by the bidder>	
2.	<b>Model</b>		<to be provided by the bidder>	
3.	Processor	Latest generation 64bit X86 Quad core processor(3Ghz) or better		
4.	Chipset	Latest series 64bit Chipset		
5.	Motherboard	OEM Motherboard		
6.	RAM	Minimum 8 GB DDR3 ECC Memory @ 1600 Mhz. Slots should be free for future upgrade. Minimum 4 DIMM slots, supporting up to 32GB ECC		



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#	Parameter	Minimum Specifications	Bidder Compliance (Yes/No)	Product Documentation Reference
7.	Graphics card	Minimum Graphics card with 2 GB video memory (non-shared)		
8.	HDD	1 TB SATA-3 Hard drive @7200 rpm with Flash Cache of 64GB SSD		
9.	Media Drive	NO CD / DVD Drive		
10.	Network interface	10/100/1000 Mbps autosensing on board integrated RJ-45 Ethernet port.		
11.	Audio	Line/Mic IN, Line-out/Spr Out (3.5 mm)		
12.	Ports	Minimum 6 USB ports (out of that 2 in front)		
13.	Keyboard	104 keys minimum OEM keyboard		
14.	Mouse	2 button optical scroll mouse (USB)		
15.	PTZ joystick controller (with 2 of the workstations in SCOC)	<ul style="list-style-type: none"> <li>• PTZ speed dome control for IP cameras</li> <li>• Minimum 10 programmable buttons</li> <li>• Multi-camera operations</li> <li>• Compatible with all the camera models offered in the solution</li> </ul>		

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#	Parameter	Minimum Specifications	Bidder Compliance (Yes/No)	Product Documentation Reference
		<ul style="list-style-type: none"> <li>Compatible with VMS /Monitoring software offered</li> </ul>		
16.	Monitor	Three Monitors of 22" TFT LED monitor, Minimum 1920 x 1080 resolution, 5 ms or better response time, TCO 05 (or higher) certified. The TFT Monitor, CPU, Mouse and keyboard workstation shall be of same make.		
17.	Certification	Energy star 5.0/BEE star certified		
18.	Operating System	64 bit pre-loaded OS with recovery disc		
19.	Security	BIOS controlled electro-mechanical internal chassis lock for the system.		
20.	Antivirus feature	Advanced antivirus, antispyware, desktop firewall, intrusion prevention (comprising of a single, deployable agent) which can be managed by a central server. (Support, updates, patches and errata for the entire contract/ project period)		
21.	<b>Power supply</b>	SMPS; Minimum 400-watt Continuous Power Supply with		

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#	Parameter	Minimum Specifications	Bidder Compliance (Yes/No)	Product Documentation Reference
		Full ranging input and APFC. Power supply should be 90% efficient with EPEAT Gold certification for the system.		

**6.11.8. LED Display**

#	Parameter	Minimum Specifications	Bidder Compliance (Yes/No)	Product Documentation Reference
1.	<b>Make</b>	<to be provided by the bidder>		
2.	<b>Model</b>	<to be provided by the bidder>		
3.	Technology	HD LED Display , Direct LED Backlight		
4.	Screen Size	55 inch diagonal or better for viewing centers		
5.	Resolution	Full high definition (Min 1920 x 1080) 16:9 Widescreen		
6.	Contrast ratio	5000:1		
7.	Brightness	350 nit		
8.	Viewing angle	178 degree/178 degree (H/V)		
9.	Response time	8ms		
10.	Control	- RS232 control - On Screen Display (OSD) - IR remote control		
11.	Operations	24x7		
12.	Additional Specifications	Should be at least UL / FCC, BIS, BEE/Energy Star certified		

**6.11.9. IP Phones**

#	Parameter	Minimum Specifications	Bidder Compliance (Yes/No)	Product Documentation Reference
1	<b>Make</b>		<to be provided by the bidder>	
2	<b>Model</b>		<to be provided by the bidder>	
3	Display	2 line or more, Monochrome display for viewing features like messages, directory		
4	Integral switch	10/100 mbps for a direct connection to a 10/100BASE-T Ethernet network through an RJ-45 interface		
5	Speaker Phone	Yes		
6	Headset	Wired, Cushion Padded Dual Ear-Speaker, Noise Cancelling headset with mouthpiece microphone, port compatibility with IP Phone		
7	VoIP Protocol	SIP V2		
8	POE	IEEE 802.3af or better and AC Power Adapter (Option)		
9	Supported Protocols	SNMP, DHCP, DNS		
10	Codecs	G.711, G.722, G.729 including handset and speakerphone		
11	Speaker Phone	Full duplex speaker phone with echo cancellation Speaker on/off button, microphone mute		
12	Volume control	Easy decibel level adjustment for speaker phone, handset and ringer		

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#	Parameter	Minimum Specifications	Bidder Compliance (Yes/No)	Product Documentation Reference
13	Phonebook/ Address book	Minimum 100 contacts		
14	Call Logs	Access to missed, received, and placed calls. (Minimum 20 overall)		
15	Clock	Time and Date on display		
16	Ringer	Selectable Ringer tone		
17	Directory Access	LDAP standard directory		
18	QoS	QoS mechanism through 802.1p/q		

**6.11.10. Network Color Laser printer**

#	Parameter	Minimum Specifications	Bidder Compliance (Yes/No)	Product Documentation Reference
1.	<b>Make</b>		<to be provided by the bidder>	
2.	<b>Model</b>		<to be provided by the bidder>	
3.	Print Speed	Black : 16 ppm or above on A3, 24 ppm or above on A4 Color : 8 ppm or above on A3, 12 ppm or above on A4		
4.	Resolution	600 X 600 DPI		
5.	Memory	8 MB or more		
6.	Paper Size	A3, A4, Legal, Letter, Executive, custom sizes		
7.	Paper Capacity	250 sheets or above on standard input		

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		tray, 100 Sheet or above on Output Tray		
8.	Duty Cycle	25,000 sheets or better per month		
9.	OS Support	Linux, Windows 2000, Vista, 7, 8, 8.1		
10.	Interface	Ethernet Interface		

**6.11.11. IP PBX (Call Control System)**

#	Minimum Specifications	Bidder Compliance (Yes/No)	Product Documentation Reference
1.	<b>Make</b>	<to be provided by the bidder>	
2.	<b>Model</b>	<to be provided by the bidder>	
3.	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		
4.	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		
5.	The system should be based on server gateway architecture with external server running on Linux OS. No card based processor systems should be quoted		
6.	The voice network architecture and call control functionality should be based on SIP		
7.	The call control system should be fully redundant solution with no single point of failure & should provide 1:1 redundancy.		
8.	The communication server and gateway should support IP V6 from day one so as to be future proof		
9.	The entire solution (IP PBX, its hardware, IP Phones, Voice Gateway) should preferably be from a single OEM		
	<b>Support for call-processing and call-control</b>		
10.	Should support signaling standards/Protocols – SIP, MGCP, H.323, Q.Sig		

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#	Minimum Specifications	Bidder Compliance (Yes/No)	Product Documentation Reference
11.	Voice Codec support - G.711, G.729, G.729ab, g.722, ILBC		
12.	The System should have GUI support web based management console		
	<b>Security</b>		
13.	The protection of signaling connections over IP by means of authentication, Integrity and encryption should be carried out using TLS		
14.	System should support MLPP feature		
15.	Proposed system should support SRTP for media encryption and signaling encryption by TLS		
16.	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		
17.	The administrator logging on to the call control server needs to authenticate by suitable mechanism such as User Login Information and Passwords/ Radius Server		
18.	Voice gateway to be provided with 1 PRI card scalable to 3 PRI in future for PSTN (PRI) line termination.		

**6.11.12. Contact Center Specifications**

**Automatic Call Distribution (ACD):**

- 1) Should be highly available with hot standby and seamless failover in case of main server failure. There should not be any downtime of Contact Center in case of single server failure.
- 2) 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) ACD support routing of incoming calls based upon caller input to menus, real-time queue statistics, time of day, day of week, ANI, dialed number etc.
- 4) ACD should support call routing based on longest available agent, circular agent selection algorithms.
- 5) 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 and expected delay.

- 6) Agents should be able to chat with other Agents or supervisor from the Agent desktop software
- 7) 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) Should support Queuing of calls and playing different prompts depending on the type of call and time in the queue.
- 9) In future if required, the ACD should support active and standby server mode, where the server can be put in DC and DR. In case of Main server in the Data center fail the standby server in DR should take over seamlessly. ACD solution should support placing of Main and Stand by server in DC and DR respectively.

**Interactive Voice Response (IVR):**

- 1) IVR should play welcome messages to callers Prompts to press and collect DTMF digits
- 2) IVR should be able to integrate with backend database for self-service, as and when required.
- 3) GUI based tool to be provided for designing the IVR and ACD call flow.
- 4) IVR should support VoiceXML for ASR, TTS, and DTMF call flows
- 5) IVR should be able to Read data from HTTP and XML Pages
- 6) IVR should be able to run outbound campaigns.

**Reporting:**

- 1) System to provide report of IVR Application Performance Analysis, Call by Call details for all the calls, Traffic analysis reports etc.
- 2) Reporting platform to support Agent level reports, Agent login, logout report, report on agent state changes
- 3) Queue reports, Abandon call reports all the reports should be summary, tabular and detailed report format to be available for the agents.
- 4) Reporting platform to support custom reports using a combination of the Crystal Reports Developer's Toolkit and SQL stored procedures.
- 5) Users of the Historical Reports should be able to perform the following functions View, print, and save reports. 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, and CSV.

**E-mail:**

- 1) Administrator should be able to assign one or more email addresses to a single Queue.
- 2) Email routing support integration with Microsoft Exchange 2003 or Microsoft Exchange 2007 or 2010.
- 3) Agents should be able to automatically resume of e-mail processing on voice disconnect.
- 4) Agent should be able to save email draft response and resume at a later time.



- 5) Agent should be able to re-queue email.
- 6) Supervisor should be able to access real-time reporting for Agent E-Mail mail volume by Queue

**6.11.13. Video Conferencing Unit**

- 1) Video Standards: H.263, H.264
- 2) Should support 30 fps & 60fps (frames per second) with 1080p resolution from day one
- 3) Video Features: Ability to send and receive two live simultaneous video sources in a single call, so that the image from the main camera and PC or document camera can be seen simultaneously
- 4) Should support H.239 and BFCP protocols with 1080p resolution
- 5) Video Output: Should have at least 2 HDMI / DVI (High Definition Multimedia Interface) output to connect Full High Definition display devices such as LCD / LED and projectors for both Video and Content. (Dual Monitor Support)
- 6) It should be possible to display the main video on one HD screen and the presentation / dual video on the other HD screen.
- 7) Video Input: Should have at least one HD video Input to connect HD camera with full functionalities as mentioned in the camera specifications.
- 8) Should have DVI (Digital Video Interface) input to connect PC / Laptop directly to the Video conferencing system and display resolutions WXGA / HD720p along with PC Audio.
- 9) Audio standards: G.711, G.722, G.722.1, 64 kbps MPEG-4 AAC-LD or equivalent standards must be supported.
- 10) Audio Inputs: Should support minimum 2 Microphone inputs. 1 needs to be supplied from day one.
- 11) 1 LAN / Ethernet - 10/100/1000 Mbps
- 12) IP - at least 6 Mbps bandwidth support
- 13) Security: Password protected system menu
- 14) ITU-T standards based Encryption of the video call
- 15) Camera: Minimum of 12X Optical zoom
- 16) 1920 x 1080 pixels progressive @ 30fps
- 17) Should have at least 70 degrees field of view (horizontal)
- 18) The Camera and codec should be from the same manufacturer

**6.11.14. Multiparty Conference Unit (Video and Audio Conferencing Bridge with Secure VC over Internet)**

- 1) The Bridging should be running on the standard Intel servers on standard Virtualized platforms. The hardware, software and virtualization software should be supplied and supported by a single bidder.

- 2) From day one the bridge must provide 6 full HD video ports @1080p 30 fps and 30 audio conference ports.
- 3) All necessary hardware to support the above capacity needs to be supplied from day one. Bridge must have a redundant power supply.
- 4) All the 10 ports must be able to connect different sites at different bandwidths and protocols. H.264 AVC standard must be supported at the minimum to connect all the 10 sites.
- 5) The bridge should support room based video end points, users joining from browsers' supporting WebRTC and HTML5 and its own clients. In case additional components are required for this functionality, all additional components required to have this functionality has to be included in the solution
- 6) The bridge should have the capability to host meetings with internal and external participants in a secure way such that it should co-exist with the enterprise security policies
- 7) The bridge should have components such as the Web Server for Web RTC, Scheduler as part of the offering from day one.
- 8) Should support H.263, H.263+, H.263++, H.264, WebRTC video algorithms
- 9) Should support video resolution from SD to Full HD to join into a conference
- 10) Along with the Support for basic algorithms like G.711 and G.722.1 the bridge should also support wideband Audio protocols like MPEG 4 AAC - LC / MPEG 4 AAC - LD
- 11) Must support the ability to allow Video conferencing devices, Clients on Mobile phones, Smart phones and Laptops to join into conference. These clients can be inside the WAN network or even on the Internet without a VPN.
- 12) The bridge should support transcoding of different Audio/video Protocols.
- 13) The bridge should have H.239/BFCP protocol for sending and receiving dual video streams (Presenter + Presentation).
- 14) The bridge must also support advanced continuous presence such that the site that is "on-air" to be seen on a larger window and the other sites are seen in smaller quadrants
- 15) The bridge must be a secure Non-PC Hardware with a strong operating system. The Hardware and software must be from the same OEM.
- 16) The bridge should support 128 Bit strong AES encryption for calls and H.235/SHA1 for authentication
- 17) It should be possible for outside agencies (for state government, central government, police department, etc.) to join the bridge for multi-party video conference call securely over internet.
- 18) They should be able to join the bridge using standards based VC endpoints using internet (as long as these endpoints are exposed to internet) securely.

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- 19) It should be possible to connect 5 such external endpoints / locations concurrently at any given point of time.
- 20) It should use secure firewall traversal technology.
- 21) It should support any standards-compliant SIP or H.323 video conferencing endpoints.
- 22) It should support for H.323 SIP Interworking Encryption and H.323 SIP Interworking DuoVideo
- 23) It should use standards based firewall traversal methods - H.460.18/19

**6.11.15. Online UPS**

#	Parameter	Minimum Specifications	Bidder Compliance (Yes/No)	Product Documentation Reference
1.	<b>Make</b>		<to be provided by the bidder>	
2.	<b>Model</b>		<to be provided by the bidder>	
3.	Capacity	Adequate capacity to cover all above IT Components at respective location		
4.	Output Wave Form	Pure Sine wave		
5.	Input Power Factor at Full Load	>0.90		
6.	Input	Three Phase 3 Wire for over 5 KVA		
7.	Input Voltage Range	305-475VAC at Full Load		
8.	Input Frequency	50Hz +/- 3 Hz		
9.	Output Voltage	400V AC, Three Phase for over 5 KVA UPS		
10.	Output Frequency	50Hz+/- 0.5% (Free running); +/- 3% (Sync. Mode)		
11.	Inverter efficiency	>90%		
12.	Over All AC-AC Efficiency	>85%		

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#	Parameter	Minimum Specifications	Bidder Compliance (Yes/No)	Product Documentation Reference
13.	UPS shutdown	UPS should shutdown with an alarm and indication on following conditions 1)Output over voltage 2)Output under voltage 3)Battery low 4)Inverter overload 5)Over temperature 6)Output short		
14.	Battery Backup	60 minutes in full load		
15.	Battery	VRLA (Valve Regulated Lead Acid) SMF (Sealed Maintenance Free) Battery		
16.	Indicators & Metering	Indicators for AC Mains, Load on Battery, Fault, Load Level, Battery Low Warning, Inverter On, UPS on Bypass, Overload, etc. Metering for Input Voltage, Output Voltage and frequency, battery voltage, output current etc.		
17.	Audio Alarm	Battery low, Mains Failure, Over temperature,		

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#	Parameter	Minimum Specifications	Bidder Compliance (Yes/No)	Product Documentation Reference
		Inverter overload, Fault etc.		
18.	Cabinet	Rack / Tower type		
19.	Operating Temp	As per Allahabad weather conditions		

**6.11.16. Fixed Dome camera for Indoor Surveillance**

#	Parameter	Minimum Specifications or better	Bidder Compliance (Yes/No)	Product Documentation Reference
1.	<b>Make</b>		<to be provided by the bidder>	
2.	<b>Model</b>		<to be provided by the bidder>	
3.	Video Compression	H.264		
4.	Video Resolution	1920 X 1080		
5.	Frame rate	Min. 25 fps		
6.	Image Sensor	1/3" Progressive Scan CCD / CMOS		
7.	Lens Type	Varifocal, IR Correction Full HD lens compatible to camera imager		
8.	Lens#	Auto IRIS 2.8-10mm		
9.	Multiple Streams	Dual streaming with 2 <sup>nd</sup> stream at minimum 720P at 30fps at H.264 individually configurable		
10.	Minimum Illumination	Color: 0.1 lux, B/W: 0.01 lux (at 30 IRE)		

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#	Parameter	Minimum Specifications or better	Bidder Compliance (Yes/No)	Product Documentation Reference
11.	IR Cut Filter	Automatically Removable IR-cut filter		
12.	Day/Night Mode	Colour, Mono, Auto		
13.	S/N Ratio	≥ 50 dB		
14.	Auto adjustment + Remote Control of Image settings	Color, brightness, sharpness, contrast, white balance, exposure control, backlight compensation, Gain Control, Auto back focus		
15.	Wide Dynamic Range	True WDR upto 80 db		
16.	Audio	Full duplex, line in and line out, G.711, G.726		
17.	Local storage	Minimum 32 GB Memory card in a Memory card slot. In the event of failure of connectivity to the central server the camera shall record video locally on the SD card automatically. After the connectivity is restored these recordings shall be automatically merged with the server recording such that no		

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#	Parameter	Minimum Specifications or better	Bidder Compliance (Yes/No)	Product Documentation Reference
		manual intervention is required to transfer the SD card based recordings to server.		
18.	Protocol	HTTP, HTTPS, FTP, RTSP, RTP, TCP, UDP, RTCP, DHCP, ONVIF Profile S &G		
19.	Security	Password Protection, IP Address filtering, User Access Log, HTTPS encryption		
20.	Intelligent Video	Motion Detection & Tampering alert		
21.	Alarm I/O	Minimum 1 Input & Output contact for 3 <sup>rd</sup> part interface		
22.	Operating conditions	As per Allahabad City conditions		
23.	Casing	NEMA 4X / IP-66 rated & IK 10		
24.	Certification	UL/EN, CE,FCC		
25.	Power	802.3af PoE (Class 0) and 12VDC/24AC		

#### **6.12. Non-IT Requirements & Specifications**

The functional requirements and technical specifications provided in the below sections and at other sections in this RFP are indicative and carry guiding rule. The MSI is free to offer products and solutions which meet requirements of the RFP focusing on the outcome, future scalability, security, reliability and adherence to specified SLA under this RFP, in line with applicable standards & best

practices adopted in the industry. The MSI is encouraged to design an Optimized solution which is technically superior, innovative, proven, better in terms of functionality and is cost effective. Any specified parameters mentioned in the scope/technical requirement in the RFP may be considered if it is required for meeting current & future requirements during the contract period. The MSI is fully responsible for the specified outcome to be achieved. It is essential that Fire Proof material be used as far as possible and Certification from Fire Department be taken for Command Centers before Go-Live.

#### **6.12.1. Civil and Architectural Work**

#	Description	Bidder Compliance (Yes/No)
<b>A.</b>	<b>False Ceiling (at Command Centers)</b>	
1	Providing and fixing metal false ceiling with powder coated 0.5mm thick hot dipped galvanised steel tiles 595 x 595 mm with regular edge (10mm) suitable for 25mm grid supported on suitable powder coated galvanised steel grid as per manufacturer specification. The same shall be inclusive of cut outs for lighting, AC grills, Fire detectors, nozzles, etc.	
2	Providing and fixing 12 mm thick fire line Gypsum false ceiling and lighting troughs 300 mm as per design including 100 mm high cornices as lighting pelmets on G.I. frame work, in G.I. vertical supports at every 450mm c/c and horizontal runners at every 900mm c/c self-taping metal screws to proper line and level. The same shall be inclusive of making holes and required framing for fixing electrical fixtures, A.C. grills etc. GI vertical supports to be anchored to slab by means of anchor fasteners.	
<b>B.</b>	<b>Furniture and Fixture</b>	
1	Workstation size of min. 18" depth made with 1.5mm thick laminate of standard make over 18mm thick commercial board complete with wooden beading including cutting holes & fixing of cable manager etc. complete with French polish. Edges shall be factory post-formed. The desk shall have the necessary drawers, keyboard trays, cabinets etc. along with sliding / opening as per approved design with quality drawer slides, hinges, locks etc.	
2	Providing & making of storage unit with 18 mm thick MDF board along with 1.5 mm approved laminate colour outside and 2 coat of enamel paint inside the storage of size 1'6"x1'6"x2'4". The same should be provided with all the required accessories	



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#	Description	Bidder Compliance (Yes/No)
	including the handle, lock, sliding channel and necessary hardware, etc. complete with French polish	
3	Cabin table of min. depth 2' made with 1.5mm thick laminate of standard make over 19mm thick commercial board complete with wooden beading including cutting holes & fixing of cable manager etc. complete with French polish.	
4	Providing, making & fixing 6" high laminated strip using 1.5mm thick laminate over 10mm thick commercial board on all vertical surface in the entire server & ancillary areas including low height partition, brick wall, partition wall, cladding etc. complete with French polish in all respect.	
5	Providing, making & fixing an enclosure for gas cylinder of Shutters and Partitions along with wooden support and 18 mm thick MDF board along with 1.5 mm approved laminate colour outside and 2 coat of enamel paint inside the shutter. The same should be provided with all the required accessories including the handle, lock, loaded hinges, tower bolt and necessary hardware etc. complete with French polish.	
<b>C.</b>	<b>Partitions</b> (wherever required as per approved drawing)	
1	Providing and fixing in position full height partition wall of 125 mm thick fire line gyp-board partition using 12.5 mm thick double fire line gyp-board on both sides with GI steel metal vertical stud frame of size 75 mm fixed in the floor and ceiling channels of 75 mm wide to provide a strong partition. Glass wool insulation inside shall be provided as required. Fixing is by self-tapping screw with vertical studs being at 610 mm intervals. The same should be inclusive of making cut-outs for switch board, sockets, grill etc. It shall also include preparing the surface smoothly and all as per manufacture's specification etc. finally finishing with one coat of approved brand of fire resistant coating.	
2	With glazing including the framework of 4" x 2" powder coated aluminium section complete (in areas like partition between server room & other auxiliary areas).	

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#	Description	Bidder Compliance (Yes/No)
3	Providing & fixing Fire Rated Wire Glass minimum 6 mm thick for all glazing in the partition wall complete. (External windows not included in this).	
4	All doors should be minimum 1200 mm (4 ft.) wide.	
<b>D.</b>	<b>Flooring</b> (wherever required as per approved drawing)	
1	The MSI shall procure and install a raised floor to match the floor height and room aesthetic in accordance with the approved final layout and design. The MSI shall consider standard parameters for developing the final height, width, point of load, and uniform distribution load of the raised floor for the rooms based on type of furniture and overall load.	
2	<p>The MSI shall ensure the following features and parameters are considered while designing and commissioning the raised floor:</p> <ol style="list-style-type: none"> <li>1. Point of Load (PoL) shall be considered 20% more than the actual load</li> <li>2. Uniform Distribution Load shall be calculated according to the final Point of Load</li> <li>3. Noise-proof</li> <li>4. Fireproof</li> <li>5. Maintenance window for easy access to under the raised floor</li> <li>6. Separate electrical and data cable tray under the raised floor</li> <li>7. Face of floor tiles shall conform to the aesthetic part of the approved design</li> </ol>	
3	The MSI shall perform load test and noise test of the constructed raised floor.	
4	<p>The MSI shall complete the following requirements for the raised flooring panels:</p> <ol style="list-style-type: none"> <li>1. Floor shall be designed for standard load conforming to BIS 875-1987.</li> <li>2. Panels shall be made up of 18-gauge steel of 600 mm × 600 mm size treated for corrosion and coated with epoxy conductive paint (minimum thickness 50 Micron).</li> </ol>	

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#	Description	Bidder Compliance (Yes/No)
	3. Raised flooring covering shall be antistatic, high-pressure laminate, two (2) mm thick in approved shade and color with PVC trim edge. It shall not make any noise while walking on it or moving equipment. Load and stress tests on floor panels shall be performed as part of acceptance testing.	
<b>E.</b>	<b>Painting</b>	
1	Providing and applying Fire retardant paint of pre-approved make and shade to give an even shade over a primer coat as per manufacturers' recommendations after applying painting putty to level and plumb and finishing with 2 coats of fire retardant paint. Base coating shall be as per manufacturer's recommendation for coverage of paint.	
2	For all vertical Plain surface.	
3	For fire line gyp-board ceiling.	
4	Providing and laying POP punning over cement plaster in perfect line and level with thickness of 10 - 12 mm including making good chases, grooves, edge banding, scaffolding pockets etc.	
5	Applying approved fire retardant coating on all vertical surfaces, furniture etc. as per manufacturer's specification.	

**6.12.2. PVC Conduit**

#	Description	Bidder Compliance (Yes/No)
1.	The conduits for all systems shall be high impact rigid PVC heavy-duty type and shall comply with I.E.E regulations for non-metallic conduit 1.6 mm thick as per IS 9537/1983.	
2.	All sections of conduit and relevant boxes shall be properly cleaned and glued using appropriate epoxy resin glue and the proper connecting pieces, like conduit fittings such as Mild Steel and should be so installed that they can remain accessible for existing cable or the installing of the additional cables.	
3.	No conduit less than 20mm external diameter shall be used. Conduit runs shall be so arranged that the cables connected to separate main circuits shall be enclosed in separate conduits,	

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#	Description	Bidder Compliance (Yes/No)
	and that all lead and return wire of each circuit shall be run to the same circuit.	
4.	All conduits shall be smooth in bore, true in size and all ends where conduits are cut shall be carefully made true and all sharp edges trimmed. All joints between lengths of conduit or between conduit and fittings boxes shall be pushed firmly together and glued properly.	
5.	Cables shall not be drawn into conduits until the conduit system is erected, firmly fixed and cleaned out. Not more than two right angle bends or the equivalent shall be permitted between draw and junction boxes. Bending radius shall comply with I.E.E regulations for PVC pipes.	
6.	Conduit concealed in the ceiling slab shall run parallel to walls and beams and conduit concealed in the walls shall run vertical or horizontal.	
7.	The chase in the wall required in the recessed conduit system shall be neatly made and shall be of angle dimensions to permit the conduit to be fixed in the manner desired. Conduit in chase shall be hold by steel hooks of approved design of 60cm center the chases shall be filled up neatly after erection of conduit and brought to the original finish of the wall with cement concrete mixture 1:3:6 using 6mm thick stone aggregate and course sand.	

**6.12.3. Wiring**

#	Description	Bidder Compliance (Yes/No)
1.	PVC insulated copper conductor cable shall be used for sub circuit runs from the distribution boards to the points and shall be pulled into conduits. They shall be stranded copper conductors with thermoplastic insulation of 650 / 1100 volts grade. Colour code for wiring shall be followed.	
2.	Looping system of wiring shall be used, wires shall not be jointed. No reduction of strands is permitted at terminations.	
3.	Wherever wiring is run through trunking or raceways, the wires emerging from individual distributions shall be bunched	

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#	Description	Bidder Compliance (Yes/No)
	together with cable straps at required regular intervals. Identification ferrules indication the circuit and D.B. number shall be used for sub main, sub circuit wiring the ferrules shall be provided at both end of each sub main and sub-circuit.	
4.	Where, single phase circuits are supplied from a three phase and a neutral distribution board, no conduit shall contain wiring fed from more than one phase in any one room in the premises, where all or part of the electrical load consists of lights, fans and/or other single phase current consuming devices, all shall be connected to the same phase of the supply.	
5.	Circuits fed from distinct sources of supply or from different distribution boards or M.C.B.s shall not be bunched in one conduit. In large areas and other situations where the load is divided between two or three phases, no two single-phase switches connected to difference phase shall be mounted within two meters of each other.	
6.	All splicing shall be done by means of terminal blocks or connectors and no twisting connection between conductors shall be allowed.	
7.	Metal clad sockets shall be of die cast non-corroding zinc alloy and deeply recessed contact tubes. Visible scraping type earth terminal shall be provided. Socket shall have push on protective cap.	
8.	All power sockets shall be piano type with associate's switch of same capacity. Switch and socket shall be enclosed in a M. S. sheet steel enclosure with the operating knob projecting. Entire assembly shall be suitable for wall mounting with Bakelite be connected on the live wire and neutrals of each circuit shall be continuous everywhere having no fuse or switch installed in the line excepting at the main panels and boards. Each power plug shall be connected to each separate and individual circuit unless specified otherwise. The power wiring shall be kept separate and distinct from lighting and fan wiring. Switch and socket for light and power shall be separate units and not combined one.	
9.	Balancing of circuits in three phases installed shall be arranged before installation is taken up. Unless otherwise specified not more than ten light points shall be grouped on one circuit and the load per circuit shall not exceed 1000 watts.	

**6.12.4. Cable Work**

#	Description	Bidder Compliance (Yes/No)
1.	Cable ducts should be of such dimension that the cables laid in it do not touch one another. If found necessary the cable shall be fixed with clamps on the walls of the duct. Cables shall be laid on the walls/on the trays as required using suitable clamping/ fixing arrangement as required. Cables shall be neatly arranged on the trays in such manner that a criss-crossing is avoided and final take off to switch gear is easily facilitated. Cable shall be laid as per the IS standard	
2.	All cables shall be identified close to their termination point by cable number as per circuit schedule. Cable numbers shall be punched on 2mm thick aluminium strips and securely fastened to the. In case of control cables all covers shall be identified by their wire numbers by means of PVC ferrules. For trip circuit identification additional red ferrules are to be used only in the switch gear / control panels, cables shall be supported so as to prevent appreciable sagging. In general distance between supports shall not be greater than 600mm for horizontal run and 750mm for vertical run.	
3.	Each section of the rising mains shall be provided with suitable wall straps so that same the can be mounted on the wall.	
4.	Whenever the rising mains pass through the floor they shall be provided with a built-in fire proof barrier so that this barrier restricts the spread of fire through the rising mains from one section to the other adjacent section. Neoprene rubber gaskets shall be provided between the covers and channel to satisfy the operating conditions imposed by temperature weathering, durability etc.	
5.	Necessary earthing arrangement shall be made alongside the rising mains enclosure by Mean of a GI strip of adequate size bolted to each section and shall be earthed at both ends. The rising mains enclosure shall be bolted type.	
6.	The space between data and power cabling should be as per standards and there should not be any criss-cross wiring of the two, in order to avoid any interference, or corruption of data.	

#### **6.12.5. Earthing**

All electrical components are to be earthen by connecting two earth tapes from the frame of the component ring and shall be connected via several earth electrodes. The cable arm shall be earthen through the cable glands. Earthing shall be in conformity with provision of rules 32, 61, 62, 67 & 68 of Indian Electricity rules 1956 and as per IS-3043. The entire applicable IT infrastructure in the Control Rooms shall be earthed.

#	Description	Bidder Compliance (Yes/No)
1.	Earthing should be done for the entire power system and provisioning should be there to earth UPS systems, Power distribution units, and AC units etc. so as to avoid a ground differential. State shall provide the necessary space required to prepare the earthing pits.	
2.	All metallic objects on the premises that are likely to be energized by electric currents should be effectively grounded.	
3.	The connection to the earth or the electrode system should have sufficient low resistance in the range of 0 to 25 ohm to ensure prompt operation of respective protective devices in event of a ground fault, to provide the required safety from an electric shock to personnel & protect the equipment from voltage gradients which are likely to damage the equipment.	
4.	Recommended levels for equipment grounding conductors should have very low impedance level less than 0.25 ohm.	
5.	In case of a UPS and Transformer equipment, the Earth resistance shall be automatically measured on an online basis at a pre-configured interval and corrective action should be initiated based on the observation. The automatic Earthing measurements should be available on the UPS panel itself	
6.	There should be enough space between data and power cabling and there should not be any cross wiring of the two, in order to avoid any interference, or corruption of data.	
7.	The earth connections shall be properly made.	
8.	A complete copper mesh earthing grid needs to be installed for the server farm area, every rack need to be connected to this earthing grid. A separate earthing pit needs to be in place for this copper mesh.	
9.	Provide separate earthing pits for servers, UPS & generators as per the standards.	

#### **6.12.6. Fire Detection and Control Mechanism**

Fire can have disastrous consequences and affect operations of a Control Room. It is required that there is early-detection of fire for effective functioning of the Control Room.

#	Description	Bidder Compliance (Yes/No)
<b>A.</b>	<b>System Description</b>	
<b>1</b>	The Fire alarm system shall be an automatic 1 ton (e.g. 8) zone single loop addressable fire detection and alarm system, utilizing conventional detection and alarm sounders.	

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#	Description	Bidder Compliance (Yes/No)
2	Detection shall be by means of automatic heat and smoke detectors located throughout the Control Room (ceiling, false floor and other appropriate areas where fire can take place) with break glass units on escape routes and exits.	
<b>B.</b>	<b>Control and Indicating Component</b>	
1	The control panel shall be a microprocessor based single loop addressable unit, designed and manufactured to the requirements of EN54 Part 2 for the control and indicating component and EN54 Part 4 for the internal power supply.	
2	All controls of the system shall be via the control panel only.	
3	The system status shall be made available via panel mounted LEDs and a backlit 8 line x 40-character alphanumeric liquid crystal display.	
4	All system controls and programming shall be accessed via an alphanumeric keypad. The control panel shall incorporate form fill menu driven fields for data entry and retrieval.	
5	The system shall include a detection verification feature. The user shall have the option to action a time response to a fire condition. This time shall be programmable up to 10 minutes to allow for investigation of the fire condition before activating alarm outputs. The operation of a manual call point shall override any verify command.	
<b>C.</b>	<b>Manual Controls</b>	
1	Start sounders	
2	Silence sounders	
3	Reset system	
4	Cancel fault buzzer	
5	Display test	
6	Delay sounder operation	
7	Verify fire condition	
8	Disable loop	
<b>D.</b>	<b>Smoke detectors</b>	
1	Smoke detectors shall be of the optical or ionisation type. Devices shall be compatible with the CIE conforming to the requirements of EN54 Part 7 and be LPCB approved. The detectors shall have twin LEDs to indicate the device has operated and shall fit a common addressable base.	
2	Heat detectors	



#	Description	Bidder Compliance (Yes/No)
3	Heat detectors shall be of the fixed temperature (58° C) or rate of temperature rise type with a fixed temperature operating point.	
4	Devices shall be compatible with the CIE conforming to the requirements of EN54 Part 5 and be LPCB approved.	
5	The detectors shall have a single LED to indicate the device has operated and shall fit a common addressable base.	
<b>E.</b>	<b>Addressable detector bases</b>	
1	All bases shall be compatible with the type of detector heads fitted and the control system component used. Each base shall comprise all necessary electronics including a short circuit isolator.	
2	The device shall be automatically addressed by the CIE on power up of the loop without the need of the insertion of a pre-programmed EPROM or setting of DIL switches.	
3	Detector bases shall fit onto an industry standard conduit box.	
<b>F.</b>	<b>Audible Alarms</b>	
1	Electronic sounders shall be coloured red with adjustable sound outputs and at least 3 sound signals. The sounders should be suitable for operation with a 24V DC supply providing a sound output of at least 100dBA at 1 meter and 75 dBA min, for a bed head or sounder base type device. The sounder frequency shall be in the range of 500Hz to 1000Hz.	
<b>G.</b>	<b>Commissioning</b>	
1	The fire detection and alarm system shall be programmable and configurable via an alpha numeric keypad on the control panel.	

#### **6.12.7. Access Control System**

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 Biometric Technology. An access control system consisting of a central PC, intelligent controllers, power supplies and all associated accessories is required to make a fully operational on line access control system. Access control shall be provided for doors. 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. Entry to the restricted area shall be by showing a proximity card near the reader and exit shall be using a push button installed in the secure area. The system shall monitor the status of the doors through magnetic reed contacts. The system should be designed and implemented to provide following functionality:

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#	Description	Bidder Compliance (Yes/No)
1	Controlled Entries to defined access points	
2	Controlled exits from defined access points	
3	Controlled entries and exits for visitors	
4	Configurable system for user defined access policy for each access point	
5	Record, report and archive each and every activity (permission granted and / or rejected) for each access point.	
6	User defined reporting and log formats	
7	Fail safe operation in case of no-power condition and abnormal condition such as fire, theft, intrusion, loss of access control, etc.	
8	Day, Date, Time and duration based access rights should be user configurable for each access point and for each user.	
9	One user can have different policy / access rights for different access points.	

## **7. Annexure II: Detailed Scope of Work and Considerations**

### **7.1. Scope of Work**

#### **7.1.1. Inception Phase**

The MSI shall be responsible for preparation of detailed project plan. The plan shall address at the minimum the following:

- i. Define an organized set of activities for the project and identify the interdependence between them.
- ii. Resource planning and loading for each phase/activity. This must also indicate where each resource would be based during that phase, i.e. onsite at the ASCL office or off site at MSI premises.
- iii. Establish and measure resource assignments and responsibilities
- iv. Highlight the milestones and associated risks
- v. Communicate the project plan to stakeholders with meaningful reports.
- vi. Measure project deadlines and performance objectives.
- vii. Project Progress Reporting. During the implementation of the project, the MSI should present weekly reports. This report shall be presented in the steering committee meeting to ASCL. The report should contain at the minimum the under mentioned:
  - a. Results accomplished during the period (weekly)
  - b. Cumulative deviations from the schedule date as specified in the finalized Project Plan
  - c. Corrective actions to be taken to return to planned schedule of progress
  - d. Plan for the next week
  - e. Proposed revision to planned schedule provided such revision is necessitated by reasons beyond the control of MSI
  - f. Support needed
  - g. Highlights/lowlights
  - h. Issues/Concerns
  - i. Risks/Show stoppers along with mitigation
- viii. Identify the activities that require the participation of client personnel (including ASCL, the Program Management Unit etc.) and communicate their time requirements and schedule early enough to ensure their full participation at the required time.

#### **7.1.2. Requirement Phase**

The MSI must perform the detailed assessment of the business requirements and IT Solution requirements as mentioned in this RFP. Based on the understanding and its own individual assessment, MSI shall develop & finalize the System Requirement Specifications (SRS) in

consultation with ASCL and its representatives. While doing so, MSI at least is expected to do following:

- a. MSI shall study and revalidate the requirements given in the RFP with ASCL and submit as an exhaustive FRS document.
- b. MSI shall develop the FRS and SRS documents.
- c. MSI shall develop and follow standardized template for requirements capturing and system documentation.
- d. MSI must maintain traceability matrix from SRS stage for the entire implementation.
- e. MSI must get the sign off from user groups formed by ASCL.
- f. For all the discussion with ASCL team, MSI shall be required to be present at ASCL office with the requisite team members.
- g. Prior to starting the site clearance, the MSI shall carry out survey of field locations as specified in Annexure IX, for buildings, structures, fences, trees, existing installations, etc.
- h. The infrastructure of existing traffic signal and other street ICT infrastructure may need to be dismantled and replaced with the new systems which are proposed and required under the scope of the project. The infrastructure like poles, cantilevers, cabling, aspects etc. should be reused to derive economies for the project with prior approval of ASCL. The dismantled infrastructure shall be delivered at the ASCL designated location without damage at no extra cost.
- i. All existing road signs which are likely to be effected by the works are to be carefully taken down and stored. Signs to be re-commissioned shall be cleaned, provided with new fixings where necessary and the posts re-painted in accordance with ASCL guidelines. Road signs, street name plate, etc. damaged by the MSI during their operation shall be repaired or replaced by MSI at no additional cost.
- j. The MSI shall directly interact with electricity boards for provision of mains power supply at all desired locations for field solution. ASCL shall facilitate the same. The recurring electricity charges shall be borne by ASCL as per actual consumption.

#### **7.1.3. Design Phase**

The MSI shall build the solution as per the Design Considerations detailed in Section 5. The solution proposed by MSI should comply with the design considerations requirements as mentioned therein.

#### **7.1.4. Development Phase**

The MSI shall carefully consider the scope of work and provide a solution that best meets the project's requirements. Considering the scope set in this RFP, the MSI shall carefully consider the solutions it proposes and explicitly mention the same in the technical proposal. The implementation of the application software shall follow the procedure mentioned below:

- a. Software Products (Configuration and Customization): In case MSI proposes software products the following need to be adhered:
- i. MSI shall be responsible for supplying the application and licenses of related software products and installing the same so as to meet project requirements.
  - ii. MSI shall have provision for procurement of licenses in a staggered manner as per the actual requirement of the project.
  - iii. The MSI shall perform periodic audits to measure license compliance against the number of valid End User software licenses consistent with the terms and conditions of license agreements, volume purchase agreements, and other mutually agreed upon licensed software terms and conditions. The MSI shall report any exceptions to license terms and conditions at the right time to ASCL. However, the responsibility of license compliance solely lies with the MSI. Any financial penalty imposed on ASCL during the contract period due to license non-compliance shall be borne by MSI.
  - iv. MSI shall also supply any other tools & accessories required to make the integrated solution complete as per requirements. For the integrated solution, the MSI shall supply:
    - a) Software & licenses.
    - b) Supply tools, accessories, documentation and provide a list of the same. Tools and accessories shall be part of the solution.
    - c) System Documentation: System Documentation both in hard copy and soft copy to be supplied along with licenses and shall include but not limited to following. Documentation to be maintained, updated and submitted to ASCL regularly :
      - Functional Requirement Specification (FRS)
      - High level design of whole system
      - Low Level design for whole system / Module design level
      - System Requirements Specifications (SyRS)
      - Any other explanatory notes about system
      - Traceability matrix
      - Technical and product related manuals
      - Installation guides
      - User manuals
      - System administrator manuals
      - Toolkit guides and troubleshooting guides

- Other documents as prescribed by ASCL
- Quality assurance procedures
- Change management histories
- Version control data
- SOPs, procedures, policies, processes, etc. developed for ASCL
- Programs :
  - Entire source codes
  - All programs must have explanatory notes for understanding
  - Version control mechanism
  - All old versions to be maintained
- Test Environment :
  - Detailed Test methodology document
  - Module level testing
  - Overall System Testing
  - Acceptance test cases

These documents need to be updated after each phase of project and to be maintained updated during entire project duration. The entire documentation shall be the property of ASCL.

#### **7.1.5. Integration Phase**

The Command and control center should be integrated with feeds of all tracks/component through OPC UA (OLE Platform Communication) deployed under the ICCC Project. The MSI shall provide the testing strategy including traceability matrix, test cases and shall conduct the testing of various components of the software developed/customized and the solution as a whole. The testing should be comprehensive and should be done at each stage of development and implementation.

The broad scope of work to be covered under Integration Phase shall include the following, but is not limited to:

S. No.	Departments/S ystems	Minimum Integration Requirements
1)	Smart LED Street Lights	<ul style="list-style-type: none"> <li>• The ICCC should aggregate various data feeds from light sensors and systems further process information out of these data feeds to provide interface /dashboards for generating alert and notifications in real time.</li> <li>• Provide single dashboard of various brand of lighting solution.</li> <li>• ICCC should support lighting control like diming, switch on/off, group control etc.</li> </ul>

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S. No.	Departments/S ystems	Minimum Integration Requirements
		<ul style="list-style-type: none"> <li>• ICCC should provide reports of various brand of lighting solution</li> <li>• Integration with GIS map</li> </ul>
2)	Sensor Based & Camera Based Smart Parking	<ul style="list-style-type: none"> <li>• Consolidates all city parking information onto a single operations platform.</li> <li>• Should provide parking availability, revenue collection information on dashboard, which receives from various sources.</li> <li>• The platform should be able to integrate any type of parking sensor irrespective of the technology used. For example, some parking sensors might use RF technology like LoRa or ZigBee to communicate the data and events, some might use GPRS or some might use Wi-Fi. Some parking sensors might use infra-red based detection, some might use magnetic field based detection or combination of the both where as some might use a video camera to detect parking occupancy. Irrespective of the technology, the platform should be able to integrate with these devices and their software managers and provide the data from such devices in a normalized and standard based data models. Viewing of CCTV feed of parking lots</li> <li>• Integration with GIS map</li> </ul>
3)	Water- SCADA & Water Meter	<ul style="list-style-type: none"> <li>• The Water SCADA should be integrated into ICCC</li> <li>• The data exchange format should be JSON/XML</li> <li>• ICCC uses an ESB or IoT API Adapter for consuming the webservices from Scada application</li> <li>• ICCC Integration Engine stores auth and other historic data for generating reports</li> <li>• ICCC initially makes call to get the authentication tokens for calling web services</li> <li>• MIS Details of following are integrated viz., <ul style="list-style-type: none"> <li>▪ Total Commercial Users</li> <li>▪ Total Domestic Users</li> <li>▪ Total Flat Rate Users</li> <li>▪ Total Water Users</li> <li>▪ Total Demand Raised for a month</li> <li>▪ Total Payments Collected Today</li> <li>▪ Total Payments Collected this month</li> <li>▪ Total Pending Payments</li> <li>▪ Season wise trends of water usage</li> </ul> </li> </ul>

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S. No.	Departments/S ystems	Minimum Integration Requirements
		<ul style="list-style-type: none"> <li>▪ Projected Demand</li> <li>▪ Area wise water demand/usage</li> <li>▪ Peak Water Usage Days in a week/month</li> <li>• KPIs on Demand vs Supply, Expected Collection vs Actuals Collected</li> <li>• Integration with GIS map</li> </ul>
4)	Power/Electricity – SCADA & Electricity Meter	<ul style="list-style-type: none"> <li>• The Electricity SCADA should be integrated into ICCC</li> <li>• The data exchange format should be JSON/XML</li> <li>• ICCC uses an ESB or IoT API Adapter for consuming the webservices from Electricity Scada application</li> <li>• ICCC Integration Engine stores auth and other historic data for generating reports</li> <li>• ICCC initially makes call to get the authentication tokens for calling web services</li> <li>• MIS Details of revenue Collection, Power Management, Usage, Peak Usage, Demand vs Distribution location wise should be integrated into the dashboard</li> <li>• MIS details of following are integrated into Dashboard viz., <ul style="list-style-type: none"> <li>▪ Total Commercial Users</li> <li>▪ Total Domestic Users</li> <li>▪ Total Flat Rate Users</li> <li>▪ Total Electricity Users</li> <li>▪ Total Demand Raised for a month</li> <li>▪ Total Payments Collected Today</li> <li>▪ Total Payments Collected this month</li> <li>▪ Total Pending Payments</li> <li>▪ Season wise trends of electricity usage</li> <li>▪ Projected Demand</li> <li>▪ Area wise electricity demand/usage</li> <li>▪ Peak Electricity Usage Days in a week/month</li> </ul> </li> <li>• KPIs on Demand vs Supply, Expected Collection vs Actuals Collected</li> <li>• Integration with IPDS software.</li> <li>• Integration with GIS map</li> </ul>
5)	GIS Based Property Tax	<ul style="list-style-type: none"> <li>• The Property Tax module should be integrated into ICCC</li> <li>• ICCC uses an ESB or IoT API Adapter for consuming the web services from Property Tax application</li> <li>• ICCC Integration Engine stores auth and other historic data for generating reports</li> <li>• ICCC initially makes call to get the authentication tokens for</li> </ul>



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S. No.	Departments/S ystems	Minimum Integration Requirements
		<p>calling web services</p> <ul style="list-style-type: none"> <li>• ICCC makes calls to get the required data from Urban Local Bodies (ULB) viz., City Corporation, City Municipal Council, Town Municipal etc.,</li> <li>• ICCC expects the following services viz., Property Details per Location,</li> <li>• ICCC displays the analytical information of property tax collections across the in a GIS map <ul style="list-style-type: none"> <li>▪ All the below services can be integrated into ICCC</li> <li>▪ Create New Property</li> <li>▪ Get Property details</li> <li>▪ Get Property Bill</li> <li>▪ Make Payment</li> <li>▪ Get Receipt</li> </ul> </li> <li>• Following reports can be displayed on ICCC, if required <ul style="list-style-type: none"> <li>▪ Demand / Collection Register</li> <li>▪ Assessment Register</li> <li>▪ Ward-wise / Zone-wise Recovery reports</li> <li>▪ Top Defaulters Report</li> <li>▪ Occupancy wise / Flat wise report'</li> <li>▪ Tax-wise Recovery Details</li> <li>▪ Tax-wise Demand Details</li> <li>▪ Advance Payment Reports</li> <li>▪ Objection / Hearing Details</li> </ul> </li> <li>• Integration with GIS map</li> </ul>
6)	City Surveillance & ITMS	<ul style="list-style-type: none"> <li>• Integrates with existing cameras and new cameras. Should support multiple video sources from multiple locations. Platform should have no limitation in displaying the number of CCTV video sources</li> <li>• Integrate and assess inputs from different sources such as CCTV, ANPR, RLVD, Speed detection systems, Traffic Violation cameras, Emergency Call Box/Panic Buttons, PA Systems, Video Analytics, and other sensors further to assist with actionable intelligence.</li> <li>• CCTV, Video Analytics, and sensors further to assist with actionable intelligence.</li> <li>• Should use dynamic channel coverage specifically for video stream function for efficient bandwidth usage for multiple Remote Control center</li> </ul>

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S. No.	Departments/S ystems	Minimum Integration Requirements
		<ul style="list-style-type: none"> <li>• Display module should have capability to control multi-screened display wall in sync with operator console</li> <li>• Should support Fixed type and PTZ camera. Control PTZ function from the screen to control the camera But with changing tile configuration each camera should be viewed with much lower resolution.</li> <li>• The system should dynamically reduce the bit rate and bandwidth for each stream based on the viewing resolution at the remote location.</li> <li>• Integration with GIS map</li> </ul>
7)	Public Wi-Fi	<ul style="list-style-type: none"> <li>• ICCC should integrate with Wi-Fi solution and project real time user information on city dashboard</li> <li>• Integration with GIS map</li> </ul>
8)	Environmental Monitoring (sensor based)	<ul style="list-style-type: none"> <li>• Monitor key inputs from city environmental sensors like Temperature, Humidity, CO, CO2, NO2, SO2, PM10, PM2.5,</li> <li>• Create awareness within the city based on dynamic inputs received from sensors and display output to various interfaces including city application, multi-services</li> <li>• Integration with GIS map</li> </ul>
9)	Solid Waste Management	<ul style="list-style-type: none"> <li>• Monitoring of the solid waste management system web application real-time level information for containers as well as the automatic warning system which notifies when containers require attention.</li> <li>• GIS based Real-time monitoring of solid waste collection vehicles.</li> <li>• Log calls/jobs on the helpdesk database utilizing helpdesk software (inquiries may be received by telephone, facsimile, email or in person).</li> <li>• Track progress of waste management service requests against pre-determined KPIs.</li> <li>• Maintain asset information held in the helpdesk database.</li> <li>• Update site specific waste management files and other documentation for helpdesk compliance.</li> <li>• Integration with GIS map</li> </ul>

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S. No.	Departments/S ystems	Minimum Integration Requirements
10)	Smart Governance (ERP) Birth & Death Module, Assets Management, Venue Booking etc.	<ul style="list-style-type: none"> <li>Integrate the portal for displaying birth and death data via APIs</li> <li>Integrate with master data and other modules for information validity</li> <li>MIS Reports on Birth/Death information per location/age/gender etc. viz., <ul style="list-style-type: none"> <li>Online Birth Certificates printed today</li> <li>Online Death Certificates printed today</li> <li>Total Birth Certificates printed</li> <li>Total Death Certificates printed</li> <li>Birth Registrations – Today</li> <li>Birth Registrations – Total</li> <li>Death Registrations – Today</li> <li>Death Registrations – Total</li> <li>Re-print requests per day/month</li> <li>Verification requests per day/month</li> <li>Pending Certificates issuance</li> <li>Location/Hospital wise birth/death registrations</li> <li>Age group wise death registrations</li> <li>Gender wise birth/death registrations</li> </ul> </li> <li>Analytics on Population vs Birth/Death</li> <li>KPI's on birth and death certificate issuance by location per location</li> <li>Integration with GIS map</li> </ul>
11)	Building Plans Approval	<ul style="list-style-type: none"> <li>The building plans approval system should be integrated into ICCC</li> <li>ICCC uses an ESB or IoT API Adapter for consuming the webservices from Building Plans approval application</li> <li>ICCC Integration Engine stores auth and other historic data for generating reports</li> <li>ICCC initially makes call to get the authentication tokens for calling web services</li> <li>MIS Details of buildings, registered and unregistered, demand should be integrated into the dashboard.</li> <li>Integration with GIS map</li> </ul>
12)	Mobile App	<ul style="list-style-type: none"> <li>Provides unified northbound API to abstract diverse sensors and its attributes by single northbound API to allow interfacing and integration with existing systems.</li> <li>The platform should be able to normalize the data coming</li> </ul>

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S. No.	Departments/S ystems	Minimum Integration Requirements
		<p>from different devices of same type (i.e. Different lighting sensor from different OEMs, different energy meters from different OEMs etc.) and provide secure access to that data using data API(s) to application developers.</p> <ul style="list-style-type: none"> <li>• Provides Query-based language to access sensor parameter from sensor cloud</li> <li>• Provides mechanism to translate and map business logic to sensor functionality</li> <li>• Integration with GIS map</li> </ul>
13)	GPS	<ul style="list-style-type: none"> <li>• ICCC should integrate with Vehicle tracking</li> <li>• ICCC should Garbage vehicles, C&amp;D Waste, Municipal sweepers, water tankers etc.</li> <li>• Actionable alerts</li> <li>• Summary of distance travelled by each vehicle.</li> <li>• Violations</li> <li>• Integration with GIS map</li> </ul>
8)	HRMS	<ul style="list-style-type: none"> <li>• The HRMS should be integrated into ICCC</li> <li>• ICCC uses an ESB or IoT API Adapter for consuming the webservices from HRMS application</li> <li>• ICCC Integration Engine stores auth and other historic data for generating reports</li> <li>• ICCC initially makes call to get the authentication tokens for calling web services</li> <li>• ICCC should integrate the MIS details of Payroll, Employee Wise Pay Summary, Department/Section wise, PF/CPF</li> </ul>

Following are the minimum use cases identified for integration for above mentioned integrations. The bidder is expected to propose more use cases based on the global leading practices and project experiences:

S. No.	Departments/ Systems	Relevant ICCC Use Cases	Data Feed Frequency	Dataset Required
1.	Solid Waste Management	Show position of Fleet on the city map	Real-time	Real-time/Near real- time location of the Fleet
2.		Display type of fleet vehicle	Batch (Quarterly)	Categorized information of various

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S. No.	Departments/ Systems	Relevant ICCC Use Cases	Data Feed Frequency	Dataset Required
				fleet types available in the city
3.		Show status of Garbage collection by ward	Real-time	Real-time/Near real-time status of Garbage collection in each ward
4.		Receive and Display Surveillance Feed	Real-time	Real-time/Near real-time feed of Surveillance Cameras
5.	Transit Management System	Show position of Buses on the bus route	Batch (Quarterly)	Documentation of Bus Routes
6.			Real-time	Real-time/Near real-time location of the Buses
7.	ITMS & City Surveillance	Show location of traffic lights	Batch (Quarterly)	Location coordinates of traffic light installations at junctions
8.		Show Status of Traffic Lights	Real-time	Real-time/Near real-time status of traffic lights downtime
9.		Show location of CCTV Cameras	Batch (Quarterly)	Location coordinates of CCTV Cameras installations at junctions
10.		Show Status of CCTV Cameras	Real-time	Real-time/Near real-time status of CCTV Cameras downtime
11.		Show location of Enforcement System	Batch (Quarterly)	Location coordinates of Enforcement System installations at junctions
12.		Show Status of Enforcement System	Real-time	Real-time/Near real-time status of Enforcement System downtime

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S. No.	Departments/ Systems	Relevant ICCC Use Cases	Data Feed Frequency	Dataset Required
13.		Show location of VMD Boards	Batch (Quarterly)	Location coordinates of VMD Boards installations at junctions
14.		Show Status of VMD Boards	Real-time	Real-time/Near real-time status of VMD Boards downtime
15.	Electrical/Power SCADA	Identify location of Energy Assets	Batch (Quarterly)	Location coordinates of Energy Assets
16.		Show the Energy Network on GIS map	Batch (Quarterly)	Location of Energy network (pipelines) across the city
17.		Identify status of Energy Assets (Sub-stations, Transmission network etc.)	Real-time	Real-time/Near real-time status of energy assets downtime
18.		Display heat map of high energy usage areas	Batch (Daily)	Meter Readings from various Commercial and Residential installations with their location details
19.		Forecast Demand	Batch (Daily)	Energy usage across 5 previous years
20.	Smart Parking System	Identify location and number of Parking Slots	Batch (Quarterly)	Location coordinates and Information of Parking facilities
21.		Show availability status of Parking Slots	Real-time	Real-time/Near real-time status of Parking Occupancy (2-wheeler and 4-wheeler)
22.		Show Revenue Collections by each Parking Facility	Real-time	Real-time/Near real-time status of Parking Fee Collections (2-wheeler and 4-

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S. No.	Departments/ Systems	Relevant ICCC Use Cases	Data Feed Frequency	Dataset Required
				wheeler)
23.	Street Lights	Identify location of Street Lights	Batch (Quarterly)	Location coordinates of Street Lights
24.		Control Street Lights status	Real-time	Real-time/Near real-time status of street lights functioning
25.		Show Status of Street Lights	Real-time	Real-time/Near real-time status of street lights functioning
26.	Property Tax	Show the Properties on GIS map	Batch (Quarterly)	Location geo-fenced coordinates of Properties
27.		Display heat map of tax collections by each ward	Batch (Weekly)	Tax collections data by each ward
28.	E-Governance	Show Population by each ward	Batch (One time upload)	Base Population data based on latest census
29.			Batch (Monthly)	Birth and Death data at a regular frequency
30.		Transmit information to citizens	Real-time	Data/Information that has to be broadcast to citizens
31.		Show status of Grievances by Ward	Batch (Daily)	Details of Grievances received
32.		Show location of Public Advertisement Boards	Batch (Quarterly)	Location coordinates of Public Advertisements
33.		Show Public Advertisements availability status	Batch (Daily)	Booking status of Public Advertisements
34.		Display heat map of advertisement tax	Batch (Weekly)	Tax collections data by each ward

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S. No.	Departments/ Systems	Relevant ICCC Use Cases	Data Feed Frequency	Dataset Required
		collections by each ward		
35.	Disaster Management	Identify Disaster Impact Area on map	Real-time	Coordinates to Geo-fence the Disaster Zone
36.		Respond to Disaster Situation	Real-time	Documented Standard Operating Procedures
37.	Emergency Management	Identify Location of Fire Hydrants	Batch (Quarterly)	Location coordinates of Fire Hydrants
38.		Show position of Fleet on the city map	Real-time	Real-time/Near real-time location of the Fleet
39.		Display type of fleet vehicle	Batch (Quarterly)	Categorized information of various fleet types available in the city
40.		Respond to Emergency Situation	Real-time	Documented Standard Operating Procedures
41.	Water	Identify location of Water Assets	Batch (Quarterly)	Location coordinates of Water Assets
42.		Show the Water Network on GIS map	Batch (Quarterly)	Location of water network (pipelines) across the city
43.		Identify status of Water Assets (Overhead Tanks, Pumps etc.)	Real-time	Real-time/Near real-time status of Water assets downtime
44.		Display heat map of high water usage areas	Batch (Daily)	Meter Readings from various Commercial and Residential installations with their location details
45.		Identification of Non-Revenue water	Batch (Quarterly)	Water inflow details across the water network



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S. No.	Departments/ Systems	Relevant ICCC Use Cases	Data Feed Frequency	Dataset Required
46.	Smart Poles	Identify location of Smart Poles	Batch (Quarterly)	Location coordinates of Smart Poles
47.		Show Status of Smart Poles – Wi-Fi Hotspots	Real-time	Real-time/Near real-time status of Wi-Fi Hotspots functioning
48.		Show Status of Smart Poles - Panic Button/Emergency Call Box	Real-time	Real-time/Near real-time status of Panic Button/Emergency Call Box functioning
49.		Show Status of Smart Poles - Public Address System	Real-time	Real-time/Near real-time status of PAS functioning
50.		Show Status of Smart Poles - Environmental sensors	Real-time	Real-time/Near real-time status of Environmental Sensors functioning
51.		Show Status of Smart Poles - Smart Billboards	Real-time	Real-time/Near real-time status of Smart Billboards functioning
52.		Show Status of Smart Poles - Surveillance	Real-time	Real-time/Near real-time status of Surveillance Cameras functioning
53.		Show Status of Smart Poles - LED Lights	Real-time	Real-time/Near real-time status of LED Lights functioning
54.		Show Status of Smart Poles - Solar Panel	Real-time	Real-time/Near real-time status of Solar Panel functioning
55.		Receive and Display Surveillance Feed	Real-time	Real-time/Near real-time feed of Surveillance Cameras
56.		Receive and Display Environmental Sensor Feed	Real-time	Real-time/Near real-time feed of Environmental Sensors

S. No.	Departments/ Systems	Relevant ICCC Use Cases	Data Feed Frequency	Dataset Required
57.		Broadcast message on PAS	Real-time	Message to be broadcast on PAS
58.		Play music on PAS	Real-time	Music tracks to be played on PAS
59.		Receive and Send messages through Panic Button/Emergency Call Box	Real-time	Not Applicable

#### **7.1.6. Go-Live Preparedness and Go-Live**

- MSI shall prepare and agree with ASCL, the detailed plan for Go-Live (in-line with ASCL's implementation plan as mentioned in RFP).
- The MSI shall define and agree with ASCL, the criteria for Go-Live.
- The MSI shall ensure that all the data migration is done from existing systems.
- MSI shall submit signed-off UAT report (issue closure report) ensuring all issues raised during UAT are being resolved prior to Go-Live.
- MSI shall ensure that Go -Live criteria as mentioned in User acceptance testing of Project is met and MSI needs to take approval from ASCL team on the same.
- Go-live of the application shall be done as per the finalized and agreed upon Go-Live plan.

#### **7.1.7. Revenue Generation Phase**

- ICCC along with its elements is a critical project under smart cities, and it is imperative that the ICCC should be made sustainable to ensure its continuity. Keeping this in mind it shall be the responsibility of the MSI to build and implement a revenue generation strategy for smart solutions and ICCC such as data monetization, Information products etc.
- The MSI shall be free to choose the options for revenue strategy, prepare a Business plan, which shall include revenue generation models based on the feasibility and viability, continuity strategy and timelines. The Business Plan shall be vetted and approved by the PMC for the SPV.
- Once approved, the MSI shall prepare the RFP in consultation of PMC for hiring an agency to Generate revenue from various models and deliver it to SPV
- The RFP shall also be approved by the PMC for SPV and assist in the hiring the agency through bid process management.

- e. The MSI is expected to develop a strategy for revenue generation options from the Integrated Command and Control Center and implemented smart solutions such as information product.
- f. The MSI is expected to study the various options for revenue generation from the scope and elements defined for smart solutions implemented.
- g. The MSI may introduce new innovative products or solutions by which revenue can be generated at its own cost.
- h. The following key options for revenue generation may be explored (as applicable):
  - Information Products for public and institutions
  - Data Monetization
  - Advertisement
  - Laid network monetization
  - Wi-Fi data
  - Data Center as IaaS, PaaS, SaaS for city start-ups

#### **7.1.8. Operations and Maintenance**

Success of the Project would lie on how professionally and methodically the entire Project is managed once the implementation is completed. From the MSI perspective too this is a critical phase since the quarterly payments are linked to the SLA's in the post implementation phases. MSI thus is required to depute a dedicated team of professionals to manage the Project and ensure adherence to the required SLAs. MSI shall provide operations and maintenance services for the software, hardware and other IT and Non-IT infrastructure installed as part of the project after Phase wise Go-Live for a period of 6 years. The scope of work for the Operations & Maintenance Phase can be categorized under 8 service categories.

##### **7.1.8.1. Project Management & Facilities Management Services**

The MSI shall be required to provide facilities management services to support the ASCL and stakeholder department officials in performing their day-to-day functions related to this system.

MSI is required to depute a dedicated, centralised project management and technical team for the overall project management and interaction with ASCL and stakeholder departments.

##### **7.1.8.2. Provision of the Operational Manpower & Contact Center Manpower to view the various data feeds and call center operations at CCCs and ICCC**

The MSI is required to provide suitable manpower to monitor the data feeds at CCCs and ICCC and support ASCL, Traffic Police and other stakeholder departments for operationalization of smart solutions of the project. The exact role of these personnel and their responsibilities would be defined and monitored by ASCL and respective departmental personnel. MSI shall be required to provide such manpower meeting following requirements:

1. All such manpower shall be minimum graduate pass

2. All such manpower shall be without any criminal background / record.
3. ASCL reserves the right to carry out background check of the personnel proposed on the Project for verification of criminal record, at the beginning of deployment or during deployment.
4. MSI shall have to replace any person, if not found suitable for the job.
5. All the manpower shall have to undergo training from the MSI for at least 15 working days on the working of project. Training should also cover dos & don'ts and shall have few sessions from ASCL and Stakeholders/End User Department officers on right approaches for monitoring the feeds & providing feedback to ASCL, Stakeholders/End User Department officers and other associated government agencies.
6. Each person shall have to undergo compulsory 1 day training every month
7. Operational Manpower shall work in 3 shifts, with no person being made to see the data feeds for more than 8 hours at a stretch.

Detail operational guideline document shall be prepared during implementation which shall specify detail responsibilities of these resources and their do's & don'ts.

The Current estimation of the man-power required from the MSI is as follows:

#	Description	Quantity
1.	Operational Manpower for operationalization of the systems (10 resources in shift 1 & 2 and 2 resources in shift 3)	12
2.	Contact Center Manpower for Call Center operations (30 resources in each shift and total 3 shifts in a day of 8 hours each)	90

The remaining operational manpower and supervisors required for operationalization of the project shall be provided by ASCL, as per requirements.

#### **7.1.8.3. Basic Infrastructure Services**

Following services shall be provided by the MSI under the basic infrastructure services:

1. Ensure availability of the infrastructure (both physical and IT) including but not limited to Power, Cooling, Racks, Storage and other peripheral equipment installed at the time of Project commissioning as per the SLAs.
2. Ensure scalability in terms of availability of racks and supporting infrastructure.
3. Proactive and reactive maintenance, repair and replacement of defective components (physical and other peripheral IT infrastructure) installed for the Project through this RFP. The cost for repair and replacement shall be borne by the MSI.
4. Any component (Physical & IT installed at the time of Project commissioning) that is reported to be faulty / non-functional on a given date should be either fully repaired or replaced by temporary substitute (of equivalent configuration) within the time frame agreed upon in the Service Level Agreement (SLA).

5. Proactive monitoring of the entire basic infrastructure installed.
6. MSI shall maintain records of the maintenance of the basic infrastructure and shall maintain a logbook on-site that may be inspected by the ASCL, Police department and other stakeholder departments/end users at any time.

#### **7.1.8.4. Network Monitoring Services**

The activities shall include:

1. MSI shall provide services for management of ICCC Project to maintain performance at optimum levels on a 24 x 7 basis.
2. MSI shall monitor and administer the network.
3. MSI shall create and modify VLAN, assignment of ports to appropriate applications and segmentation of traffic.
4. MSI shall carry out break fix maintenance of the LAN cabling or maintenance work requiring civil work.

#### **7.1.8.5. Integration Testing**

This shall be a black-box testing role primarily to ensure that the application to be deployed does not disrupt the Allahabad operations and affect other Allahabad infrastructure in terms of performance and security. The technical tasks to be carried out shall be as follows:

1. Functional Testing: Ensuring that the application functionality as described by the ASCL, Police department and other stakeholder departments/end users. The functional testing of application shall necessarily be minimal as this is a core responsibility of the Supplier.
2. Performance Testing: Ensuring that the application meets expressed performance requirements on the Allahabad servers by using performance test tools and performance monitoring tools.
3. Security Testing: Testing for exploitable application security weaknesses that undermine the application security or the security of the infrastructure.

#### **7.1.8.6. Vendor Management Services**

The activities shall include:

1. Coordination with all the project stakeholders to ensure that all Allahabad activities are carried out in a timely manner.
2. MSI shall coordinate and follow-up with all the relevant vendors to ensure that the issues are resolved in accordance with the SLAs agreed upon with them.
3. MSI shall also ensure that unresolved issues are escalated to respective departments.
4. MSI shall maintain database of the various vendors with details like contact person, telephone nos., escalation matrix, response time and resolution time commitments etc.

5. MSI shall draw a consolidated quarterly SLA performance report across vendors for consideration of the ASCL, Police department and other stakeholder departments/end users.

#### **7.1.8.7. Network Management**

The objective of this service is to ensure continuous operation and upkeep of the Network infrastructure of the project including all active and passive components. The selected MSI shall be responsible to coordinate with Network Service Provider for network related issues between CCC, ICCC, DC, DR and other sub systems. The services to be provided for Network Management include:

1. Ensuring that the network is available 24x7x365 as per the prescribed SLAs for the 6 years of operations
2. Attending to and resolving network failures and snags.
3. Support and maintain the overall network infrastructure including but not limited to LAN passive components, routers, switches etc.
4. Configuration and backup of network devices including documentation of all configurations.
5. 24x7x365 monitoring of the network to spot the problems immediately.
6. Provide information on performance of Ethernet segments, including capacity utilization and error statistics for the segment and the top-contributing hosts, WAN links and routers.
7. Ensuring timely information to the ASCL, Police department and other stakeholder departments/end users pertaining to issues of Network Backbone

#### **7.1.8.8. Physical Infrastructure Management and Maintenance Services**

All the devices that shall be installed in the Project as part of the physical infrastructure should be SNMP enabled and shall be centrally and remotely monitored and managed on a 24x7x365 basis. Industry leading infrastructure management solution should be deployed to facilitate monitoring and management of the Infrastructure on one integrated console. The physical infrastructure management and maintenance services shall include:

1. Proactive and reactive maintenance, repair and replacement of defective components (IT and Non-IT/ Hardware and Software). The cost for repair and replacement shall be borne by the MSI.
2. The MSI shall have to stock and provide adequate onsite and offsite spare parts and spare component to ensure that the uptime commitment as per SLA is met. To provide this service it is important for the MSI to have back to back arrangement with the OEMs. The MSI needs to provide a copy of the service level agreement signed with the respective OEMs.
3. Component that is reported to be down on a given date should be either fully repaired or replaced by temporary substitute (of equivalent configuration) within the time frame

indicated in the Service Level Agreement (SLA). In case the selected MSI fails to meet the above standards of maintenance, there shall be a penalty as specified in the SLA.

4. The selected MSI shall also maintain records of all maintenance of the system and shall maintain a logbook on-site that may be inspected by the ASCL, Police department and other stakeholder departments/end users at any time.

#### **7.1.9. Exit Management**

- a. This sets out the provisions, which shall apply on expiry or termination of the Master Service Agreement, the Project Implementation, Operation and Management SLA.
- b. In the case of termination of the Project Implementation and/or Operation and Management, the Parties shall agree at that time whether, and if so during what period, the provisions of this Schedule shall apply.
- c. The Parties shall ensure that their respective associated entities carry out their respective obligations set out in this Exit Management Schedule.

##### **7.1.9.1. Cooperation and Provision of Information**

During the exit management period:

- a. The MSI shall allow the ASCL or its nominated agency access to information reasonably required to define the current mode of operation associated with the provision of the services to enable the ASCL to assess the existing services being delivered;
- b. Promptly on reasonable request by the ASCL, the MSI shall provide access to and copies of all information held or controlled by them which they have prepared or maintained in accordance with this agreement relating to any material aspect of the services (whether provided by the MSI or sub-contractors appointed by the MSI). The ASCL shall be entitled to copy of all such information. Such information shall include details pertaining to the services rendered and other performance data. The MSI shall permit the ASCL or its nominated agencies to have reasonable access to its employees and facilities, to understand the methods of delivery of the services employed by the MSI and to assist appropriate knowledge transfer.

##### **7.1.9.2. Confidential Information, Security and Data**

- a. The MSI shall promptly on the commencement of the exit management period supply to the ASCL or its nominated agency the following:
  - information relating to the current services rendered and customer and performance data relating to the performance of sub-contractors in relation to the services;
  - documentation relating to Intellectual Property Rights;
  - documentation relating to sub-contractors;

- all current and updated data as is reasonably required for purposes of ASCL or its nominated agencies transitioning the services to its Replacement MSI in a readily available format nominated by the ASCL, its nominated agency;
  - all other information (including but not limited to documents, records and agreements) relating to the services reasonably necessary to enable ASCL or its nominated agencies, or its Replacement MSI to carry out due diligence in order to transition the provision of the Services to ASCL or its nominated agencies, or its Replacement MSI (as the case may be).
- b. Before the expiry of the exit management period, the MSI shall deliver to the ASCL or its nominated agency all new or up-dated materials from the categories set out in Schedule above and shall not retain any copies thereof, except that the MSI shall be permitted to retain one copy of such materials for archival purposes only.

#### **7.1.9.3. Transfer of Certain Agreements**

On request by the ASCL or its nominated agency the MSI shall effect such assignments, transfers, licenses and sub-licenses ASCL, or its Replacement MSI in relation to any equipment lease, maintenance or service provision agreement between MSI and third party lessors, vendors, and which are related to the services and reasonably necessary for the carrying out of replacement services by the ASCL or its nominated agency or its Replacement MSI.

#### **7.1.9.4. General Obligations of the MSI**

- a. The MSI shall provide all such information as may reasonably be necessary to effect as seamless handover as practicable in the circumstances to the ASCL or its nominated agency or its Replacement MSI and which the MSI has in its possession or control at any time during the exit management period.
- b. For the purposes of this Schedule, anything in the possession or control of any MSI, associated entity, or sub-contractor is deemed to be in the possession or control of the MSI.
- c. The MSI shall commit adequate resources to comply with its obligations under this Exit Management Schedule.

#### **7.1.9.5. Exit Management Plan**

- a. The MSI shall provide the ASCL or its nominated agency with a recommended exit management plan ("Exit Management Plan") which shall deal with at least the following aspects of exit management in relation to the MSA as a whole and in relation to the Project Implementation, and the Operation and Management SLA.
- A detailed program of the transfer process that could be used in conjunction with a Replacement MSI including details of the means to be used to ensure continuing provision of the services throughout the transfer process or until the cessation of the services and of the management structure to be used during the transfer;



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- plans for the communication with such of the MSI's sub-contractors, staff, suppliers, customers and any related third party as are necessary to avoid any material detrimental impact on the ASCL's operations as a result of undertaking the transfer;
  - (if applicable) proposed arrangements for the segregation of the MSI's networks from the networks employed by ASCL and identification of specific security tasks necessary at termination;
  - Plans for provision of contingent support to ASCL, and Replacement MSI for a reasonable period after transfer.
- b. The MSI shall re-draft the Exit Management Plan annually thereafter to ensure that it is kept relevant and up to date.
- c. Each Exit Management Plan shall be presented by the MSI to and approved by the ASCL or its nominated agencies.
- d. The terms of payment as stated in the Terms of Payment Schedule include the costs of the MSI complying with its obligations under this Schedule.
- e. In the event of termination or expiry of MSA, and Project Implementation, each Party shall comply with the Exit Management Plan.
- f. During the exit management period, the MSI shall use its best efforts to deliver the services.
- g. Payments during the Exit Management period shall be made in accordance with the Terms of Payment Schedule.
- h. This Exit Management plan shall be furnished in writing to the ASCL or its nominated agencies within 90 days from the Effective Date of this Agreement.

#### **7.1.10. Compliance to Standards & Certifications**

- a. For a large and complex set up such as the Project, it is imperative that the highest standards applicable are adhered to. In this context, the MSI shall ensure that the entire Project is developed in compliance with the applicable standards.
- b. During project duration, the MSI shall ensure adherence to prescribed standards as provided below:

<b>Sl. No.</b>	<b>Component/Application/System</b>	<b>Prescribed Standard</b>
1.	Information Security	ISO 27001
2.	IT Infrastructure Management	ITIL specifications
3.	Service Management	ISO 20000 specifications
4.	Project Documentation	IEEE/ISO/CMMi (where applicable) specifications for documentation

- c. Apart from the above the MSI need to ensure compliance of the project with Government of India IT security guidelines including provisions of:
  - The Information Technology Act, 2000” and amendments thereof and
  - Guidelines and advisories for information security published by Cert-In/DeitY (Government of India) issued till the date of publishing of tender notice. Periodic changes in these guidelines during project duration need to be complied with.
- d. While writing the source code for application modules the MSI should ensure high-quality documentation standards to improve the readability of the software module. An illustrative list of comments that each module contained within the source file should be preceded by is outlined below:
  - The name of the module
  - The date when module was created
  - A description of what the module does
  - A list of the calling arguments, their types, and brief explanations of what they do
  - A list of required files and/or database tables needed by the module
  - Error codes/Exceptions
  - Operating System (OS) specific assumptions
  - A list of locally defined variables, their types, and how they are used
  - Modification history indicating who made modifications, when the modifications were made, and what was done.

- e. Apart from the above, MSI needs to follow appropriate coding standards and guidelines inclusive of but not limited to the following while writing the source code -
  - Proper and consistent indentation
  - Inline comments
  - Structured programming
  - Meaningful variable names
  - Appropriate spacing
  - Declaration of variable names
  - Meaningful error messages
- f. Quality Audits
  - ASCL, at its discretion, may also engage independent auditors to audit any/some/all standards/processes. The MSI shall support all such audits as per calendar agreed in advance. The result of the audit shall be shared with the MSI who has to provide an effective action plan for mitigations of observations/non-compliances, if any.

#### **7.1.11. Project Management and Governance**

##### **7.1.11.1. Project Management Office (PMO)**

A Project Management office shall be set up during the start of the project. The PMO shall, at the minimum, include a designated full time Project Manager from MSI. It shall also include key persons from other relevant stakeholders including members of ASCL and other officials/representatives by invitation. The operational aspects of the PMO need to be handled by the MSI including maintaining weekly status, minutes of the meetings, weekly/monthly/project plans, etc.

PMO shall meet formally on a weekly basis covering, at a minimum, the following agenda items:

- i. Project Progress
- ii. Delays, if any – Reasons thereof and ways to make-up lost time
- iii. Issues and concerns
- iv. Performance and SLA compliance reports;
- v. Unresolved and escalated issues;
- vi. Project risks and their proposed mitigation plan
- vii. Discussion on submitted deliverable
- viii. Timelines and anticipated delay in deliverable if any
- ix. Any other issues that either party wishes to add to the agenda.

During the development and implementation phase, there may be a need for more frequent

meetings and the agenda would also include:

- i. Module development status
- ii. Testing results
- iii. IT infrastructure procurement and deployment status
- iv. Status of setting up/procuring of the Helpdesk, DC hosting
- v. Any other issues that either party wishes to add to the agenda.

Bidder shall recommend PMO structure for the project implementation phase and operations and maintenance phase.

#### **7.1.11.2. Helpdesk and Facilities Management Services**

The MSI shall be required to establish the helpdesk and provide facilities management services to support the ASCL and stakeholder department officials in performing their day-to-day functions related to this system.

The MSI shall setup a central helpdesk dedicated (i.e. on premise) for the Project, which shall be supported by individual smart city command centers, implemented and proposed to be setup under Allahabad Smart City Programme. This helpdesk would be operational upon implementation of the Project. Providing helpdesk/support services from a shared facility of any other party/provider is not permitted.

Functional requirements of the helpdesk management system, fully integrated with the enterprise monitoring and network management system. The system shall be accessed by the stakeholder department officials for raising their incidents and logging calls for support. The detailed service levels and response time, which the MSI is required to maintain for provisioning of the FMS services are described in the Service Level Agreement of this Tender.

MSI shall deploy Manpower during implementation and O&M phases. The deployed resource shall report to ASCL's Project In-charge for Smart City Project and work closely with Program Management Office of the project. Following are the minimum resources required to be deployed in the Project, however MSI may deploy additional resources based on the need of the Project and to meet the defined SLAs in this RFP:

#	Type of Resource	Minimum Quantity	Minimum Deployment during Operation and Maintenance phase
1.	Project Manager	1	100% (8*5)
2.	Solution Architect	1	Onsite Support to Project team on need basis
3.	Intelligent Traffic Management Expert	1	100% (24*7)
4.	Software Application Expert	1	100% (24*7)
5.	Network & Security –	1	100% (24*7)

#	Type of Resource	Minimum Quantity	Minimum Deployment during Operation and Maintenance phase
	Infrastructure Expert		
6.	Database Architect/DBA	1	100% (24*7)
7.	Server and Storage Expert	1	100% (24*7)
8.	Technical Expert-GIS	1	100% (24*7)
9.	Technical Expert-IBMS	1	100% (24*7)
10.	Command Center Operators	12	100% (24*7 –10 resources in shift 1 & 2 and 2 resources in shift 3)
11.	Contact Center Manpower	90	100% (24*7 –30 resources in each shift)

Note: Numbers provided for staff providing 24\*7 support is excluding relievers.

#### **7.1.11.3. Steering Committee**

The Steering Committee shall consist of senior stakeholders from ASCL, its nominated agencies and MSI. MSI shall nominate its Smart City vertical head to be a part of the Project Steering Committee

The MSI shall participate in monthly Steering Committee meetings and update Steering Committee on Project progress, Risk parameters (if any), Resource deployment and plan, immediate tasks, and any obstacles in project. The Steering committee meeting shall be a forum for seeking and getting approval for project decisions on major changes etc.

All relevant records of proceedings of Steering Committee should be maintained, updated, tracked and shared with the Steering Committee and Project Management Office by MSI.

During the development and implementation phase of the project, it is expected that there shall be at least fortnightly Steering Committee meetings. During the O&M phase, the meetings shall be held at least once a quarter.

Other than the planned meetings, in exceptional cases, ASCL may call for a Steering Committee meeting with prior notice to the MSI.

#### **7.1.11.4. Project Monitoring and Reporting**

The MSI shall circulate written progress reports at agreed intervals to ASCL and other stakeholders. Project status report shall include Progress against the Project Management Plan, status of all risks and issues, exceptions and issues along with recommended resolution etc.

Other than the planned meetings, in exceptional cases, project status meeting may be called with prior notice to the Bidder. ASCL reserves the right to ask the bidder for the project review reports other than the standard weekly review reports.

#### **7.1.11.5. Risk and Issue management**

The MSI shall develop a Risk Management Plan and shall identify, analyses and evaluate the project risks, and shall develop cost effective strategies and action plans to mitigate those risks.

The MSI shall carry out a Risk Assessment and document the Risk profile of ASCL based on the risk appetite and shall prepare and share the ASCL Enterprise Risk Register. The MSI shall develop an issues management procedure to identify, track, and resolve all issues confronting the project. The risk management plan and issue management procedure shall be done in consultation with ASCL.

The MSI shall monitor, report, and update the project risk profile. The risks should be discussed with ASCL and a mitigation plan be identified during the project review/status meetings. The Risk and Issue management should form an agenda for the Project Steering Committee meetings as and when required.

#### **7.1.11.6. Governance procedures**

MSI shall document the agreed structures in a procedures manual.

#### **7.1.11.7. Planning and Scheduling**

The MSI shall prepare a detailed schedule and plan for the entire project covering all tasks and sub tasks required for successful execution of the project. The MSI has to get the plan approved from ASCL at the start of the project and it should be updated every week to ensure tracking of the progress of the project.

The project plan should include the following:

1. The project break up into logical phases and sub-phases;
2. Activities making up the sub-phases and phases;
3. Components in each phase with milestones;
4. The milestone dates are decided by ASCL in this RFP. MSI cannot change any of the milestone completion dates. MSI can only propose the internal task deadlines while keeping the overall end dates the same. MSI may suggest improvement in project dates without changing the end dates of each activity.
5. Key milestones and deliverables along with their dates including those related to delivery and installation of hardware and software;
6. Start date and end date for each activity;
7. The dependencies among activities;
8. Resources to be assigned to each activity;
9. Dependency on ASCL

#### **7.1.11.8. License Metering / Management**

The MSI shall track software usage throughout the IT setup so as to effectively manage the risk of unauthorized usage or under-licensing of software installed at the CCCs, ICCC, and DC. This may be carried out through the use of standard license metering tools.

**7.1.12. Change Management & Control**

**7.1.12.1. Change Orders / Alterations / Variations**

- a. The MSI agrees that the requirements given in the Bidding Documents are minimum requirements and are only indicative. The MSI would need to fetch out the details at the time of preparing the design document prior to actual implementation. It shall be the responsibility of the MSI to meet all the requirements of technical specifications contained in the RFP and any upward revisions and/or additions of quantities, specifications sizes given in the Bidding Documents required to be made during execution of the works, shall not constitute a change order and shall be carried out without a change order and shall be carried out without any time and cost effect to Purchaser.
- b. Further upward revisions and or additions required to make MSI's selected equipment and installation procedures to meet Bidding Documents requirements expressed and to make entire facilities safe, operable and as per specified codes and standards shall not constitute a change order and shall be carried out without any time and cost effect to Purchaser.
- c. Any upward revision and/or additions consequent to errors, omissions, ambiguities, discrepancies in the Bidding Documents which the MSI had not brought out to the Purchaser's notice in his bid shall not constitute a change order and such upward revisions and/or addition shall be carried out by MSI without any time and cost effect to Purchaser.

**7.1.12.2. Change Order**

- a. The Change Order shall be initiated only in case (i) the Purchaser directs in writing the MSI to include any addition to the scope of work covered under this Contract or delete any part of the scope of the work under the Contract, (ii) MSI requests to delete any part of the work which shall not adversely affect the operational capabilities of the facilities and if the deletions proposed are agreed to by the Purchaser and for which cost and time benefits shall be passed on to the Purchaser, (iii) the Purchaser directs in writing the MSI to incorporate changes or additions to the technical specifications already covered in the Contract.
- b. Any changes required by the Purchaser over and above the minimum requirements given in the specifications and drawings etc. included in the Bidding Documents before giving its approval to detailed design or Engineering requirements for complying with technical specifications and changes required to ensure systems compatibility and reliability for safe operation (As per codes, standards and recommended practices referred in the Bidding Documents) and trouble free operation shall not be construed to be change in the Scope of work under the Contract.

- c. Any change order as stated in Clause 2 a. comprising an alteration which involves change in the cost of the works (which sort of alteration is hereinafter called a “Variation”) shall be the Subject of an amendment to the Contract by way of an increase or decrease in the schedule of Contract Prices and adjustment of the implementation schedule if any.
- d. If parties agree that the Contract does not contain applicable rates or that the said rates are inappropriate or the said rates are not precisely applicable to the variation in question, then the parties shall negotiate a revision of the Contract Price which shall represent the change in cost of the works caused by the Variations. Any change order shall be duly approved by the Purchaser in writing.
- e. Within ten (10) working days of receiving the comments from the Purchaser or the drawings, specification, purchase requisitions and other documents submitted by the MSI for approval, the MSI shall respond in writing, which item(s) of the Comments is/are potential changes(s) in the Scope of work of the RFP document covered in the Contract and shall advise a date by which change order (if applicable) shall be submitted to the Purchaser.

#### **7.1.13. Testing and Acceptance Criteria**

- a. MSI shall demonstrate the following mentioned acceptance criteria prior to acceptance of the solution as well as during project operations phase, in respect of scalability and performance etc. The MSI may propose further detailed Acceptance criteria which the ASCL shall review. Once ASCL provides its approval, the Acceptance criteria can be finalized. In case required, parameters might be revised by ASCL in mutual agreement with bidder and the revised parameters shall be considered for acceptance criteria. A comprehensive system should be set up that would have the capability to log & track the testing results, upload & maintain the test cases and log & track issues/bugs identified.
- b. The following table depicts the details for the various kinds of testing envisaged for the project:

Type of Testing	Responsibility	Scope of Work
System Testing	MSI	<ul style="list-style-type: none"><li>1. MSI to perform System testing</li><li>2. MSI to prepare test plan and test cases and maintain it. ASCL may request the MSI to share the test cases and results</li><li>3. Should be performed through manual as well as automated methods</li><li>4. Automation testing tools to be provided by MSI. ASCL doesn't intend to own these tools</li></ul>
Integration Testing	MSI	<ul style="list-style-type: none"><li>1. MSI to perform Integration testing</li><li>2. MSI to prepare and share with ASCL the Integration test plans and test cases</li><li>3. MSI to perform Integration testing as per the approved plan</li></ul>



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Type of Testing	Responsibility	Scope of Work
		<ol style="list-style-type: none"> <li>Integration testing to be performed through manual as well as automated methods</li> <li>Automation testing tools to be provided by MSI. ASCL doesn't intend to own these tools</li> </ol>
Performance and load Testing	<ul style="list-style-type: none"> <li>MSI</li> <li>ASCL / Third Party Auditor ( to monitor the performance testing)</li> </ul>	<ol style="list-style-type: none"> <li>MSI to do performance and load testing.</li> <li>Various performance parameters such as transaction response time, throughput, page loading time should be taken into account.</li> <li>Load and stress testing of the Project to be performed on business transaction volume</li> <li>Test cases and test results to be shared with ASCL.</li> <li>Performance testing to be carried out in the exact same architecture that would be set up for production.</li> <li>MSI need to use performance and load testing tool for testing. ASCL doesn't intend to own these tools. ASCL if required, could involve third party auditors to monitor/validate the performance testing. Cost for such audits to be paid by ASCL.</li> </ol>
Security Testing (including Penetration and Vulnerability testing)	<ul style="list-style-type: none"> <li>MSI</li> <li>ASCL / Third Party Auditor ( to monitor the security testing)</li> </ul>	<ol style="list-style-type: none"> <li>The solution should demonstrate the compliance with security requirements as mentioned in the RFP including but not limited to security controls in the application, at the network layer, network, data center(s), security monitoring system deployed by the MSI</li> <li>The solution shall pass vulnerability and penetration testing for rollout of each phase. The solution should pass web application security testing for the portal, mobile app and other systems and security configuration review of the infrastructure.</li> <li>MSI should carry out security and vulnerability testing on the developed solution.</li> <li>Security testing to be carried out in the exact same environment/architecture that would be set up for production.</li> <li>Security test report and test cases should be shared with ASCL</li> <li>Testing tools if required, to be provided by MSI. ASCL doesn't intend to own these tools</li> </ol>

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Type of Testing	Responsibility	Scope of Work
		<p>7. During O&amp;M phase, penetration testing to be conducted on yearly basis and vulnerability assessment to be conducted on half-yearly basis.</p> <p>8. ASCL shall also involve third party auditors to perform the audit/review/monitor the security testing carried out by MSI. Cost for such auditors to be paid by ASCL.</p>
User Acceptance Testing of Project	<ul style="list-style-type: none"> <li>ASCL or ASCL appointed third party auditor</li> </ul>	<p>1. ASCL / ASCL appointed third party auditor to perform User Acceptance Testing</p> <p>2. MSI to prepare User Acceptance Testing test cases</p> <p>3. UAT to be carried out in the exact same environment/architecture that would be set up for production</p> <p>4. MSI should fix bugs and issues raised during UAT and get approval on the fixes from ASCL / third party auditor before production deployment</p> <p>5. Changes in the application as an outcome of UAT shall not be considered as Change Request. MSI has to rectify the observations.</p>

**Note:**

- Bidder needs to provide the details of the testing strategy and approach including details of intended tools/environment to be used by MSI for testing in its technical proposal. ASCL does not intend to own the tools.
- The MSI shall work in a manner to satisfy all the testing requirements and adhere to the testing strategy outlined. The MSI must ensure deployment of necessary resources and tools during the testing phases. The MSI shall perform the testing of the solution based on the approved test plan, document the results and shall fix the bugs found during the testing. It is the responsibility of MSI to ensure that the end product delivered by the MSI meets all the requirements specified in the RFP. The MSI shall take remedial action based on outcome of the tests.
- The MSI shall arrange for environments and tools for testing and for training as envisaged. Post Go-Live; the production environment should not be used for testing and training purpose. If any production data is used for testing, it should be masked and it should be protected. Detailed process in this regard including security requirement should be provided by the MSI in its technical proposal. The process shall be finalized with the selected bidder.
- All the Third Party Auditors (TPA) as mentioned above shall be appointed and paid by ASCL directly. All tools/environment required for testing shall be provided by the MSI.
- STQC/Other agencies appointed by ASCL shall perform the role of TPA. MSI needs to engage with the TPA at the requirement formulation stage itself. This is important so

that unnecessary re-work is avoided and the audit is completed in time. The audit needs to be completed before Go-Live of different phases. MSI needs to prepare and provide all requisite information/documents to third party auditor and ensure that there is no delay in overall schedule.

- f. The cost of rectification of non-compliances shall be borne by the MSI.

#### **7.1.13.1. Factory Testing**

Success MSI shall have to submit Factory Test Certificate for the below mentioned materials before the actual supply of the items.

1. Cable
2. Pole
3. Signal Aspects

Authorized representative from ASCL shall visit the manufacturing plant of the product subject to present in India. Authorized representative shall check the testing process.

#### **7.1.13.2. Final Acceptance Testing**

The final acceptance shall cover 100% of the I Project, after successful testing by the ASCL, Police Department, other stakeholders/end user department or its PMU; a Final Acceptance Test Certificate (FAT) shall be issued by the ASCL to the MSI.

Prerequisite for Carrying out FAT activity:

1. Detailed test plan shall be developed by the MSI and approved by ASCL. This shall be submitted by MSI before FAT activity to be carried out.
2. All documentation related to ICCC Project and relevant acceptance test document (including IT Components, Non IT Components etc.) should be completed & submitted before the final acceptance test to the ASCL.
3. The training requirements as mentioned should be completed before the final acceptance test.
4. Successful hosting of Application, NMS and MIS Software.
5. For both IT & Non-IT equipment's / software manuals / brochures / Data Sheets / CD / DVD / media for all the Allahabad Project supplied components.

The FAT shall include the following:

1. All hardware and software items must be installed at respective sites as per the specification.
2. Availability of all the defined services shall be verified.
3. The MSI shall be required to demonstrate all the features / facilities / functionalities as mentioned in the RFP.

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4. The MSI shall arrange the test equipment required for performance verification, and shall also provide documented test results.
5. The MSI shall be responsible for the security audit of the establishes system to be carried out by a certified third party as agreed by ASCL.

Any delay by the MSI in the Final Acceptance Testing shall render him liable to the imposition of appropriate Penalties. However, delays identified beyond the control of MSI shall be considered appropriately and as per mutual agreement between ASCL and MSI. In the event the MSI is not able to complete the installation due to non-availability of bandwidth from the bandwidth service providers, the Supplier and ASCL may mutually agree to redefine the Network so the MSI can complete installation and conduct the Final Acceptance Test within the specified time.

## **8. Annexure III: Payment Schedule and Milestones**

The payment schedule and milestones are divided into four phases:

i. Implementation & Integration Phase-1

ii. Implementation & Integration Phase-2

iii. Integration Phase

iv. Operations and Maintenance Phase

ASCL shall issue a “Request Order” in writing, indicating the number of units of Hardware and Software to be supplied along with the location (Project Site). The ASCL shall continue to issue such request until the full quantities of Hardware and Software specified in volume 1 within the variation limits of RFP is exhausted. Upon getting the Request Order, the MSI shall promptly and as soon as possible within the lead time specified in the request order, supply, install and implement specified numbers of hardware and software at stated project site and commissioned the same. ASCL shall specify the Lead Time in Request Order. The Lead Time of Request Order shall be decided in discussion with the Service Provider before the Request Order is placed. ASCL’s decision in this regard shall be final but reasonable time shall be provided to the MSI. Delay or non-performance shall form the basis for application of Liquidated Damages. Tentative Number of Request Orders and Lead Time as envisaged at this point of time is specified below.

<b>Services</b>	<b>Approximate Time for Issuance of Request Order</b>	<b>Tentative Scope/ Approximate Sizing</b>	<b>Tentative Lead Time</b>
Request Order 1	One week post issue of LOI/ completion of site survey activity	<ol style="list-style-type: none"> <li>1. KM CCC &amp; MCR CCC - IT hardware</li> <li>2. KM CCC &amp; MCR CCC - Non-IT equipment</li> <li>3. KM CCC &amp; MCR CCC – software</li> <li>4. Data Center (DC) – Hardware</li> <li>5. Data Center (DC) – Software</li> <li>6. Data Center (DC)– Non-IT equipment</li> <li>7. Temporary Viewing Centers- IT/ Non-IT Infrastructure- 4 Locations</li> <li>8. Implementation and Integration of City Surveillance System – 276 Traffic Junctions/Locations</li> <li>9. Implementation and Integration of Adaptive Traffic Control System (ATCS) – 17 Traffic Junctions/Locations</li> </ol>	5 months post issuance of Request Order 1

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<b>Services</b>	<b>Approximate Time for Issuance of Request Order</b>	<b>Tentative Scope/ Approximate Sizing</b>	<b>Tentative Lead Time</b>
		<ul style="list-style-type: none"> <li>10. Implementation and Integration of Variable Message Display (VMD) Boards - 40 Traffic Junctions/Locations</li> <li>11. Implementation and Integration of Solid Waste Management (SWM) System including CCTV Surveillance Cameras for 48 Kudda Addas</li> </ul>	
Request Order 2	Post Go-Live of Request Order 1	<ul style="list-style-type: none"> <li>1. Dismantling, transportation and Reinstallation- Partial Infrastructure of KM CCC, MCR CCC, DC &amp; Viewing Centers- IT Hardware/Software &amp; Non-IT equipment</li> <li>2. ICCC- IT hardware</li> <li>3. ICCC- Non-IT equipment</li> <li>4. ICCC – software</li> <li>5. Augmentation of Data Center (DC) – Hardware</li> <li>6. Augmentation of Data Center (DC) – Software</li> <li>7. Augmentation of Data Center (DC)– non-IT equipment</li> <li>8. Disaster Recovery (DR) services</li> <li>9. Implementation and Integration of City Surveillance System – 94 Traffic Junctions/Locations</li> <li>10. Implementation and Integration of Adaptive Traffic Control System (ATCS) – 26 Traffic Junctions/Locations</li> <li>11. Dismantling, transportation and Reinstallation of Variable Message Display (VMD) Boards – 31 Traffic Junctions/Locations</li> <li>12. Implementation and Integration of RLVD Systems– 18 Traffic Junctions/Locations</li> <li>13. Implementation and Integration of Solid Waste Management</li> </ul>	9 months post issuance of Request Order 2

<b>Services</b>	<b>Approximate Time for Issuance of Request Order</b>	<b>Tentative Scope/ Approximate Sizing</b>	<b>Tentative Lead Time</b>
		(SWM) System including CCTV Surveillance System for 50 Vulnerable Garbage Points 14. Implementation and Integration of Transit Management System for 250 City Buses 15. Implementation and Integration of Environmental Sensors- 28 Locations 16. Implementation and Integration of Smart Parking System – 1 MLCP 17. Integration with GIS (Sub-System) 18. Integration with Smart Governance (New Modules, Sub- System) 19. Integration with e-Health System 20. Integration with e-Education System 21. Integration with Smart Street Lighting system 22. Integration with Smart Parking (New System and Sensors Only)	
Request Order 3	Post Go-Live of Request Order 2	1. Integration with Power SCADA 2. Integration with Sewerage SCADA 3. Integration with Water SCADA	2 months post issuance of Request Order 3

### **8.1. Milestones and Payment Schedules for Implementation Phase**

Based on findings of the site survey activity done by the MSI, the MSI may propose a change in the number of sites or individual units to be deployed in each phase as well as overall scope and a consequent change in phasing. ASCL also retains the right to suo-moto change the number of sites or individual units to be deployed for each scope item. The final decision on change in phasing and related change in payment schedules shall be at the discretion of ASCL.

MSI should complete all the activities within the defined timelines as indicated above. The timeline shall be reviewed regularly during implementation phase and may be extended incase ASCL feels that extension in a particular Request Order/Integration or any track is imperative, for the reason beyond the control of the bidder. In all such cases ASCL's decision shall be final and binding. The MSI

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shall be eligible for the payment based on the completion of activities and approval of the relevant deliverables.

**D = Effective Date of Contract Agreement**

**D1= Date of Issue of Request Order 1**

**D2= Date of Issue of Request Order 2**

**D3= Date of Issue of Request Order 3**

<b>Milestones</b>	<b>Payment Milestones for the Implementation % Payment of Time Schedule Phase</b>	<b>Payment Schedule</b>	<b>Time Schedule</b>	<b>Deliverable</b>
<b>M1</b>	Project Kick-off	Value commensurate to the discovered quote for site survey activity as per commercial format	D	NA
<b>M2</b>	<b>Request Order 1</b>			
M2.1	Request Order 1 – Site Survey of Phase I Locations	10% of Request Order 1 Value (Capex Cost) post issuance of Request Order 1	D1 + 15 Days	1.Inception Report 2.Project Plan 3.Risk Management and Mitigation Plan 4.Site Survey report 5.Final BoQ
M2.2	Requirement Phase Completion  Design Phase Completion	10% of Request Order 1 Value (Capex Cost)	D1 + 1 Month	1. CONOPS document  2. Functional Requirement Specification document 3. System Requirement Specification document 4. Requirements Traceability Matrix
M2.3	Request Order 1 – Delivery and Receipt of Hardware and Software at site and after Verification of such items by	30% of Request Order 1 Value (Capex Cost)	D1+ 2 Months	1. HLD documents 2. LLD documents 3. Application architecture documents. 4. Technical Architecture documents. 5. Network Architecture documents. 6. Logical and physical database design.



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<b>Milestones</b>	<b>Payment Milestones for the Implementation % Payment of Time Schedule Phase</b>	<b>Payment Schedule</b>	<b>Time Schedule</b>	<b>Deliverable</b>
	ASCL/ASCL authorized agency			7. Data dictionary and data definitions. 8. GUI design (screen design, navigation, etc.). 9. Test Plans 10. Change management Plan
M2.4	Power-up (for hardware), Installation, configuration and Application deployment	10% of Request Order 1 Value (Capex Cost)	D1 + 4 Months	1. IT and Non IT Infrastructure Installation Report 2. Completion of UAT and closure of observations report 3. Training Completion report 4. Application deployment and configuration report
M2.5	Request Order 1 – Completion of Integration of Smart Features and Go- Live of Phase I	20% of Request Order 1 Value (Capex Cost)	D1 + 5 Months	1. Integration Testing Report 2. Go-Live Report
M2.6	Request Order 1 – Submission of SoP's	10% of Request Order 1 Value (Capex Cost)	D1+6 Months	1. SOPs
M 2.7	Request Order 1 – Three months of successful operation and Maintenance after Project Acceptance	10% of Request Order 1 Value (Capex Cost)	D1+8 Months	
<b>M3</b>	<b>Request Order 2</b>			

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<b>Milestones</b>	<b>Payment Milestones for the Implementation % Payment of Time Schedule Phase</b>	<b>Payment Schedule</b>	<b>Time Schedule</b>	<b>Deliverable</b>
M3.1	Request Order 2 – Site Survey of Part II Locations	10% of Request Order 2 Value (Capex Cost) post issuance of Request Order 2	D2 + 1 Month	1. Site Survey report 2. Final BoQ
M3.2	Requirement Phase Completion  Design Phase Completion	10% of Request Order 2 Value (Capex Cost)	D2 + 2 Month	1. Functional Requirement Specification document for request order 2 2. Updated System Requirement Specification document 3. Updated Requirements Traceability Matrix
M3.3	Request Order 2 – Delivery and Receipt of Hardware and Software at site and after Verification of such items by ASCL/ASCL authorized agency	30% of Request Order 2 Value (Capex Cost)	D2+ 2.5 Months	1. HLD documents 2. LLD documents 3. Application architecture documents. 4. Technical Architecture documents. 5. Network Architecture documents. 6. Logical and physical database design. 7. Data dictionary and data definitions. 8. GUI design (screen design, navigation, etc.). 9. Test Plans 10. Change management Plan
M3.4	Power-up (for hardware), Installation, configuration and Application deployment	10% of Request Order 2 Value (Capex Cost)	D2 + 7 Months	1. IT and Non IT Infrastructure Installation Report 2. Completion of UAT and closure of observations report 3. Training Completion report 4. Application deployment and configuration report

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<b>Milestones</b>	<b>Payment Milestones for the Implementation % Payment of Time Schedule Phase</b>	<b>Payment Schedule</b>	<b>Time Schedule</b>	<b>Deliverable</b>
M3.5	Request Order 2 – Completion of Integration of Smart Features and Go- Live of Phase II	20% of Request Order 2 Value (Capex Cost)	D2 + 9 Months	1. Integration Testing Report 2. Go-Live Report
M3.6	Request Order 2 – Submission of SoP's	10% of Request Order 2 Value (Capex Cost)	D2+10 Months	1. SOPs
M 3.7	Request Order 2 – Three months of successful operation and Maintenance after Project Acceptance	10% of Request Order 2 Value (Capex Cost)	D2+12 Months	
<b>M4</b>	<b>Request Order 3</b>			
M4.1	Request Order 3 – Assessment of Requirement	10% of Request Order 3 Value (Capex Cost) post issuance of request order 3	D3 + 1 Month	1. Functional Requirement Specification document for request order 3
M4.2	Request Order 3 – Completion of Integration Smart Features and Go-Live (Project Acceptance)	70% of Request Order 3 Value (Capex Cost) post issuance of request order 3	D3 + 2 Months	1. Updated System Requirement Specification document 2.Updated Requirements Traceability Matrix 3. Test Plan 4. UAT and Integration Testing Report 4. Go-Live Report
M4.3	Request Order 3 – Submission of SoP's	10% of Request Order 3 Value (Capex Cost) post issuance of request order 3	D3 + 3 Months	1. SOPs

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<b>Milestones</b>	<b>Payment Milestones for the Implementation % Payment of Time Schedule Phase</b>	<b>Payment Schedule</b>	<b>Time Schedule</b>	<b>Deliverable</b>
M4.4	Request Order 3 – Three months of successful operation and Maintenance after Project Acceptance	10% of Request Order 3 Value (Capex Cost) post issuance of request order 3	D + 5 Months	

**Note:**

- All payments to the Master Systems Integrator (MSI) shall be made upon submission of invoices along with necessary approval certificates from concerned Authorities.
- The above payments are subject to meeting of SLA's failing which the appropriate deductions as mentioned in the SLA document of this RFP.
- Payment for Integration with Individual sub system can be released after 3 months of given timeline of each phase in case of the any of the sub systems of that phase is not ready

**8.2 Milestones and Payment Schedules for Operations and Maintenance Phase**

The Operations and maintenance phase shall start as soon as Go-Live for the each phase occurs. The MSI shall be required to adhere to the SLA and provide post implementations support of warranty and O&M for a period of 6 years after implementation/Phase wise Go-Live.

<b>Milestones</b>	<b>Payment Milestones for the Implementation % Payment of Time Schedule Phase</b>	<b>Payment Schedule</b>	<b>Time Schedule</b>
M5	Payment for O&M after Go-Live of Phase 1 during Kumbh Mela 2019	Equal Monthly O&M Payments	Payment of 4 Months
M6	Year 1 payment for O&M after Go-Live	Equal Quarterly O&M Payments	Payment of Year 1
M7	Year 2 payment for O&M after Go-Live	Equal Quarterly O&M Payments	Payment of Year 2
M8	Year 3 payment for O&M after Go-Live	Equal Quarterly O&M Payments	Payment of Year 3
M9	Year 4 payment for O&M after Go-Live	Equal Quarterly O&M Payments	Payment of Year 4
M10	Year 5 payment for O&M after Go-Live	Equal Quarterly O&M Payments	Payment of Year 5
M11	Year 6 payment for O&M after Go-Live	Equal Quarterly O&M Payments	Payment of Year 6

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Payment of Operations and maintenance phase shall be made on monthly basis for initial 4 months during the Kumbh Mela 2019 and subsequently, shall be made on quarterly basis (at completion of each quarter) based on the adherence to SLA, for the amount quoted for each respective year.

## **9. Annexure IV- Common guidelines regarding compliance of systems/equipment**

1. The specifications mentioned for various IT / Non-IT components are indicative requirements and should be treated for benchmarking purpose only. MSIs are required to undertake their own requirement analysis and may propose higher specifications that are better suited to the requirements.
2. Any manufacturer and product name mentioned in the Tender should not be treated as a recommendation of the manufacturer / product.
3. All IT Components should support IPv4 and IPv6
4. All IT/Electronics components shall be in compliance to the IEC/ISI/BSI standards as applicable
5. All systems shall be designed to ensure accessibility to the disabled hence all the components related to IT, electronics and/or digital technology should be in accordance to the latest version of WCAG and the European Standards - EN 301 549 or an equivalent standard as approved
6. MSI should adhere with the open standard oneM2M wherever applicable during solution design and implementation
7. The specifications provided in this RFP are indicative and carry guiding rule. The MSI is free to offer products and solutions which meet requirements of the RFP focussing on the outcome, future scalability, security, reliability and adherence to specified SLA under this RFP, in line with applicable standards & best practices adopted in the industry. The MSI is encouraged to design an Optimised solution which is technically superior, innovative, proven, better in terms of functionality and is cost effective. Any specified parameters mentioned in the scope/technical requirement in the RFP may be considered if it is required for meeting current & future requirements during the contract period. Necessary justification should be given in Technical solution accordingly. The MSI is fully responsible for the specified outcome to be achieved.
8. Technical Bid should be accompanied by OEM's product brochure / datasheet. Bidders should provide complete make, model, for all equipment/software quoted, in the Technical Bid.
9. Bidder should ensure that only one make and model is proposed for one component in Technical Bid for example all PTZ cameras must belong to a single OEM and must be of the same model etc.
10. Bidders should ensure warranty and support for all equipment from OEMs during the contract period. All the back-to-back service agreements should be submitted along with the Technical Bid.
11. All equipment, parts should be original and new.
12. The user interface of the system should be a user friendly Graphical User Interface (GUI).

13. Critical core components of the system should not have any requirements to have proprietary platforms and should conform to open standards.
14. For custom made modules, industry standards and norms should be adhered to for coding during application development to make debugging and maintenance easier. Object oriented programming methodology must be followed to facilitate sharing, componentizing and multiple-use of standard code. Before hosting the application, it shall be subjected to application security audit (by any of the CERTIN empanelled vendors) to ensure that the application is free from any vulnerability; and approved by the ASCL.
15. All the Clients Machines / Servers shall support static assigned IP addresses or shall obtain IP addresses from a DNS/DHCP server.
16. The indicative architecture of the system is given in this volume. The Successful Bidder must provide the architecture of the solution it is proposing.
17. The system servers and software applications shall be hosted in Data Center as specified in the Bid. It is important that the entire set of Data Center equipment are in safe custody and have access from only the authorized personnel and should be in line with the requirements & SLAs defined in the RFP .
18. The Servers provided should meet industry standard performance parameters (such as CPU Utilisation of 60 percent or less, disk utilisation of 75 percent or less). In case any non-standard computing environment is proposed (such as cloud), detail clarification needs to be provided in form of supporting documents, to confirm (a) how the sizing has been arrived at and (b) how SLAs would be met.
19. MSI is required to ensure that there is no choking point / bottleneck anywhere in the system (end-to-end) and enforce performance and adherence to SLAs. SLA reports must be submitted as specified in the Bid without fail.
20. All the hardware and software supplied should be from the reputed Original Equipment Manufacturers (OEMs). ASCL/or any other authorized agency as nominated by the Authority reserves the right to ask replacement of any hardware / software if it is not from a reputed brand and conforms to all the requirements specified in the RFP documents.
21. Cameras and the Video Management / Video Analytics Software should be ONVIF Core Specification '2.X' or 'S', 'G' compliant and provide support for ONVIF profiles such as Streaming, Storage, Recording, Playback, retrieval of local stored video and Access Control.
22. Master System Integrator shall place orders on various OEMs directly and not through any sub-contractor / partner.
23. Master System Integrator (MSI) shall consider the Allahabad City weather requirements for the entire year while proposing the equipment's/products/systems/components etc. as part of their solution design.
24. All licenses should be in the name of the Allahabad Smart City Limited (ASCL).

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**NOTE:** For all supply equipment's, registered service/support center of the respective OEM should be existing or established in India within 30 days of award of contract. The Bidder should submit an undertaking from the OEM to that effect.



## **10. Annexure V - Status of the Systems to be integrated in ICCC in Allahabad City**

<b>S.No.</b>	<b>ICT Systems</b>	<b>Status of current Automation</b>	<b>Future Roadmap</b>
1	Smart Lighting	Partial	Yes
2	Solid Waste Management	Partial	Yes
3	Intelligent Traffic Management System (ITMS)	No	Yes
4	Environment Sensors	No	Yes
5	City Surveillance	Partial	Yes
6	Smart Governance	Partial	Yes
7	Smart Parking	Partial	Yes
8	Sewerage	No	Yes, Near Future
9	Power SCADA	No	Yes, Near Future
10	GIS	No	Yes, Near Future
11	Water SCADA	No	Yes, Near Future
12	Storm water Drainage	No	Yes, Near Future
13	Transit Management System for City Buses	No	Yes

## 11. Annexure VI – Smart City Guidelines for ensuring Universal Access IT Systems to empower citizens with disability to access ICT systems with ease

Sl. No.	Parameters	Minimum Requirements
1	Text Alternatives	Provide text alternatives for any non-text content so that it can be changed into other forms people need, such as large print, braille, speech, symbols or simpler language.
2	Non-text Content	All images, form image buttons, and image map hot spots have appropriate, equivalent alternative text. Images that do not convey content, are decorative, or contain content that is already conveyed in text are given null alt text (alt="") or implemented as CSS backgrounds. All linked images have descriptive alternative text. Equivalent alternatives to complex images are provided in context or on a separate (linked and/or referenced via) page.
3	Time-based Media	Provide alternatives for time-based media.
4	Audio Description or Media Alternative (Pre-recorded)	A descriptive text transcript OR audio description audio track is provided for non-live, web-based video
5	Adaptable	Create content that can be presented in different ways (for example simpler layout) without losing information or structure.
6	Info and Relationships	Semantic mark-up is used to designate headings (<h1>), lists (<ul>, <ol>, and <dl>), emphasized or special text (<strong>, <code>, <abbr>, <blockquote>, for example), etc. Semantic markup is used appropriately. Tables are used for tabular data. Where necessary, data cells are associated with their headers. Data table captions and summaries are used where appropriate. Text labels are associated with form input elements. Related form elements are grouped with field set/legend.
7	Meaningful Sequence	The reading and navigation order (determined by code order) is logical and intuitive.
8	Use of Color	Color is not used as the sole method of conveying content or distinguishing visual elements. Color alone is not used to distinguish links from surrounding text unless the luminance contrast between the link and the surrounding text is at least 3:1 and an additional differentiation (e.g., it becomes underlined) is provided when the link is hovered over or receives focus.
9	Audio Control	A mechanism is provided to stop, pause, mute, or adjust volume for audio that automatically plays on a page for more than 3 seconds.
10	Resize text	The page is readable and functional when the text size is doubled.

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11	Images of Text	If the same visual presentation can be made using text alone, an image is not used to present that text.
12	Keyboard Accessible	Make all functionality available from a keyboard.
13	Keyboard	All page functionality is available using the keyboard, unless the functionality cannot be accomplished in any known way using a keyboard (e.g., free hand drawing). Page-specified shortcut keys and access keys (access key should typically be avoided) do not conflict with existing browser and screen reader shortcuts.
14	No Keyboard Trap	Keyboard focus is never locked or trapped at one particular page element. The user can navigate to and from all navigable page elements using only a keyboard.
15	Pause, Stop, Hide	Automatically moving, blinking, or scrolling content that lasts longer than 5 seconds can be paused, stopped, or hidden by the user. Moving, blinking, or scrolling can be used to draw attention to or highlight content as long as it lasts less than 5 seconds. Automatically updating content (e.g., automatically redirecting or refreshing a page, a news ticker, AJAX updated field, a notification alert, etc.) can be paused, stopped, or hidden by the user or the user can manually control the timing of the updates.
16	Seizures	Do not design content in a way that is known to cause seizures.
17	Three Flashes or Below Threshold	No page content flashes more than 3 times per second.
18	Navigable	Provide ways to help users navigate, find content, and determine where they are
19	Bypass Blocks	A link is provided to skip navigation and other page elements that are repeated across web pages. If a page has a proper heading structure, this may be considered a sufficient technique instead of a "Skip to main content" link. Note that navigating by headings is not yet supported in all browsers. If a page uses frames and the frames are appropriately titled, this is a sufficient technique for bypassing individual frames.
20	Page Titled	The web page has a descriptive and informative page title.
21	Focus Order	The navigation order of links, form elements, etc. is logical and intuitive.
22	Headings and Labels	Page headings and labels for form and interactive controls are informative. Avoid duplicating heading (e.g., "More Details") or label text (e.g., "First Name") unless the structure provides adequate differentiation between them.
23	Focus Visible	It is visually apparent which page element has the current keyboard focus (i.e., as you tab through the page, you can see where you are).
24	Readable	Make text content readable and understandable
25	Language of Page	The language of the page is identified using the HTML lang attribute

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26	Language of Parts	The language of page content that is in a different language is identified using the lang attribute.
27	Predictable	Make Web pages appear and operate in predictable ways.
28	On Input	When a user inputs information or interacts with a control, it does not result in a substantial change to the page, the spawning of a pop-up window, an additional change of keyboard focus, or any other change that could confuse or disorient the user unless the user is informed of the change ahead of time.
29	Compatible	Maximize compatibility with current and future user agents, including assistive technologies.
30	Parsing	Significant HTML/XHTML validation/parsing errors are avoided. In content implemented using markup languages, elements have complete start and end tags, elements are nested according to their specifications, elements do not contain duplicate attributes, and any IDs are unique, except where the specifications allow these features.
31	Name, Role, Value	Markup is used in a way that facilitates accessibility. This includes following the HTML/XHTML specifications and using forms, form labels, frame titles, etc. appropriately. For all user interface components, the name and role can be programmatically determined; states, properties, and values that can be set by the user can be programmatically set; and notification of changes to these items is available to user agents, including assistive technologies.
32	Audio-only and Video-only (Pre-recorded)	A descriptive text transcript (including all relevant visual and auditory clues and indicators) is provided for non-live, web-based audio (audio podcasts, MP3 files, etc.). A text or audio description is provided for non-live, web-based video-only (e.g., video that has no audio track).
33	Captions (Pre-recorded)	Synchronized captions are provided for non-live, web-based video (YouTube videos, etc.)
34	Captions (Live)	Synchronized captions are provided for all live multimedia that contains audio (audio-only broadcasts, web casts, video conferences, Flash animations, etc.)
35	Audio Description (Pre-recorded)	Audio descriptions are provided for all video content NOTE: Only required if the video conveys content visually that is not available in the default audio track.
36	Sensory Characteristics	Instructions do not rely upon shape, size, or visual location (e.g., "Click the square icon to continue" or "Instructions are in the right-hand column"). Instructions do not rely upon sound (e.g., "A beeping sound indicates you may continue.").
37	Distinguishable	Make it easier for users to see and hear content including separating foreground from background.
38	Contrast (Minimum)	Text and images of text have a contrast ratio of at least 4.5:1. Large text - at least 18 point (typically 24px) or 14 point (typically 18.66px) bold has a contrast ratio of at least 3:1.

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39	Enough Time	Provide users enough time to read and use content.
40	Timing Adjustable	If a page or application has a time limit, the user is given options to turn off, adjust, or extend that time limit. This is not a requirement for real-time events (e.g., an auction), where the time limit is absolutely required, or if the time limit is longer than 20 hours.
41	Link Purpose (In Context)	The purpose of each link (or form image button or image map hotspot) can be determined from the link text alone, or from the link text and its context (e.g., surrounding paragraph, list item, table cell, or table headers). Links (or form image buttons) with the same text that go to different locations are readily distinguishable.
42	Multiple Ways	Multiple ways are available to find other web pages on the site - at least two of: a list of related pages, table of contents, site map, site search, or list of all available web pages.
43	On Focus	When a page element receives focus, it does not result in a substantial change to the page, the spawning of a pop-up window, an additional change of keyboard focus, or any other change that could confuse or disorient the user.
44	Consistent Navigation	Navigation links that are repeated on web pages do not change order when navigating through the site.
45	Consistent Identification	Elements that have the same functionality across multiple web pages are consistently identified. For example, a search box at the top of the site should always be labelled the same way.
46	Input Assistance	Help users avoid and correct mistakes.
47	Error Identification	Required form elements or form elements that require a specific format, value, or length provide this information within the element's label. If utilized, form validation errors are presented in an efficient, intuitive, and accessible manner. The error is clearly identified, quick access to the problematic element is provided, and user is allowed to easily fix the error and resubmit the form.
48	Labels or Instructions	Sufficient labels, cues, and instructions for required interactive elements are provided via instructions, examples, properly positioned form labels, and/or field sets/legends.
49	Error Suggestion	If an input error is detected (via client-side or server-side validation), provide suggestions for fixing the input in a timely and accessible manner.
50	Error Prevention (Legal, Financial, Data)	If the user can change or delete legal, financial, or test data, the changes/deletions can be reversed, verified, or confirmed.
51	Visual Captcha	Alternative mode of authentication should be offered to in order to be authenticated
52	Mandatory use of Unicode for regional language	Unicode facilitates assistive technology to access content.

## **12. Annexure VII – Cyber Security Requirements for Allahabad Smart City Project**

### **12.1. Cyber Security Framework**

The Bidder shall develop Cyber Security Framework aimed at building a secure and resilient cyberspace for citizens and stakeholders of Smart City. The Framework shall be designed to protect cyberspace information and infrastructure; build capabilities to prevent and respond to cyber-attacks; and minimize damages through coordinated efforts of institutional structures, people, processes, and technology. Framework shall cover smart city cyber security architecture with reference to the cyber security framework suggested by National Institute of Standards and Technology (NIST), CSA (Cloud Security Alliance) and ISO27001. Framework shall also comply with MoUD guidelines vide circular K- 1s016/6U2016-SC-1.

### **12.2. Cyber Security Policy**

The Bidder shall ensure creation and implementation of Smart City Cyber Security Policy and related procedures in line with relevant international standards. The policy shall address security of hardware and software, along with the connectivity between the field device and the respective application software. The bidder shall ensure to develop and implement Standard Operating Procedures for smooth Operations and Maintenance of IT infrastructure.

### **12.3. Cyber Security Governance**

1. The Bidder shall conduct Risk Assessment and prepare Risk Treatment Plan for the IT applications and infrastructure deployed in smart city ecosystem.
2. The Bidder shall facilitate management reporting in form of dashboard covering Risk Assessment results along with risk treatment plan and timeline to the smart city management.
3. The Bidder shall implement all the controls as identified during the Risk assessment and treatment plan as per the agreed timelines.

### **12.4. Cyber Security Organization Structure**

1. The Bidder shall clearly define Organization structure for Smart City Cyber Security with skilled personnel and adequate representation from Senior Management. The organization structure shall also include the roles and responsibilities of personnel deployed for cyber security of smart city.
2. The smart city cyber security resources shall be deployed as part of the team during the complete contract period i.e. implementation and operation stage.

### **12.5. Smart City IT Asset Management**

1. The Bidder shall utilize automated asset management tools to prepare the information asset register (IAR) for all IT assets deployed in the Smart city. The IAR shall capture criticality, rating, classification, owner and custodian of the Asset.

2. The Bidder shall develop and implement an appropriate set of procedures for information labelling and handling in accordance with the classification scheme proposed in the cyber security policy of smart city.

#### **12.6. Physical & Environmental Security**

1. The bidder shall implement and manage physical security of IT assets of smart city, which shall include, as a minimum: locks, alarms, surveillance equipment, sensors, access control systems (biometrics), etc. The bidder shall also design processes and procedures for same.
2. The Bidder shall ensure that all the equipment, information or software shall not be taken off-site without appropriate authorization.

#### **12.7. Access Control**

1. The Bidder shall ensure that users shall be provided single sign on functionality if required for the applications and solutions deployed in Smart City.
2. The smart city solution should support multiple authentication methods such as Username password, two factor authentication, digital certificate and biometric based authentication.
3. 2FA solution should be capable of being deployed on mobile devices deployed for smart city
4. Solution should have the capability to define access based on time of day, day of week or by group or user defined access.
5. The smart city solution should have the functionality to provide authentication based on the role.
6. Remote access to all smart city IT users shall be securely managed.
7. The smart city solution should be able to deploy and configure the approved password policy and should provide the feature to configure the logs.
8. The smart city solution should have the option of blocking multiple sessions for the user.
9. All smart city applications should support role based access control to enforce separation of duties.
10. The application deployed in smart city should display the last login status (successful/unsuccessful, time) to the user and should not store authentication credentials on client computers after a session terminates
11. All smart city solution should be compliant with Indian IT Act, 2000 and Amended IT Act, 2008

#### **12.8. Communications and Operations Management**

1. Bidders must ensure that the IT systems in the smart city infrastructure are open, scalable and interoperable. The deployed systems must operate within 4 layers – Sensory layer, communication layer, data layer and application layer adhering to relevant security controls as mandated by the MoUD guidelines.
2. Bidders shall ensure that all the interfaces between IoT devices, field sensors, device applications and storage deployed in smart city are encrypted using appropriate protocols, algorithm and key pairs.

3. All transport link communication must be encrypted and sensitive data both in rest and transit is to be secured using encryption.
4. Bidders must ensure that all the changes made to the smart city infrastructure incl. of IoT field devices, sensors and related applications should be tracked and recorded in order to enable security monitoring of the infrastructure. The maintained logs should be systematically collated, enabling the access of critical information as per date, fortnight, month, quarter, year etc.
5. Bidders should ensure that separate environments are maintained for production, test and development for smart city infrastructure and solutions to reduce the risks of unauthorized access or changes.
6. Bidders must ensure that smart city IT systems are designed in such a way that only authenticated users have access to the smart city database. Also, the provision of access has to be routed only through designated applications.
7. Bidders must ensure that sensitive data is stored in the smart city database in an encrypted format thereby curtailing the database administrator from reading or modifying the stored sensitive data.
8. Bidders must ensure that the smart city architecture should include a VPN solution enabling designated users to access necessary applications and functions from remote applications.
9. Bidders must enable for the maintenance of an audit trail to record all the administrator, user level activities including the failed attempts thereby enabling a robust high level security monitoring of the smart city security infrastructure.
10. Bidders must ensure that the smart city components – Network elements, Operating system, Applications etc. are in sync and adhere to a singular master clock. Thereby ensuring an appropriate logging/ time stamping of incidents and bolstering smooth operation of the smart city.
11. Bidders must ensure that adequate security controls are deployed against the tampering of log information and unauthorized access to the smart city infrastructure such as the data center, IoT device control room etc.
12. Bidders must ensure that platforms hosted in the central data center support multi-tenancy with adequate authentication and role based access. This can be achieved by utilizing Authentication and privilege management technology thereby controlling the access of data as per user privileges.
13. Bidders must ensure that the smart city architecture accounts for latency issues for the flow of data between devices. Suitable protocols should be utilized to minimize data flow latency upon management of heterogeneous data.
14. Bidders must strictly make sure that the communication between IoT field devices and their respective management applications happens only over a data layer (digital platform). Thereby enabling this designated layer to be the one true source of data abstraction, normalization and correlation.
15. Bidders must ensure that the smart city IT infrastructure including the Wi-Fi network adheres to relevant and applicable security standards and protocols. Also, bidders must make sure that the Application Program Interfaces (APIs) are published and the IT systems run on standard protocols.



16. Bidders must ensure that the smart city architecture end-to-end has adequate security controls to enforce safety, privacy and integrity of confidential data. Necessary controls must be deployed to protect the integrity of data flowing into the control systems and other critical infrastructure.
17. Bidders must enable for wireless/ broadband architecture used in the smart city infrastructure to interface with other/citywide wireless networks thereby enabling interoperability.
18. Bidders must ensure that IoT field devices and sensory equipment operating within the smart city periphery connect only to authorize wireless networks. Secure Wi-Fi guidelines as prescribed by the Department of Telecom must be followed.
19. Bidders must make sure that the wireless layer of the smart city network is appropriately segmented, bifurcating the network into various trusted zones. Thereby segregating public and utility networks via VPN (Virtual private networks), ensuring that the traffic from internet users is not routed into sensor networks and vice versa.
20. Bidders must enable for the authentication of the sensory equipment during the provisioning of the sensors and connection into the smart city infrastructure.
21. Bidders must ensure that the data aggregators used for enabling the interoperability between field IoT devices and sensors functioning on different protocols incorporate appropriate authentication and encryption at the aggregator gateway when field devices are not capable of authenticating /encrypting critical information.
22. Bidders must ensure that the IoT field devices and sensory equipment deployed in smart city periphery must not have a physical interface for administration. System and Network monitoring should be only performed remotely thereby ensuring local cyber-attacks/ tampering of field devices is curtailed.
23. Bidders must ensure appropriate network segregation. The smart city data center must be systematically segmented into multiple zones. Each zone must have a dedicated functionality. IoT field devices and sensory equipment must be connected to a completely separate network isolated from public networks and other private networks.
24. Bidders must make sure that the internet facing segment of the data center must incorporate a DMZ (Demilitarized zone), where customer application servers would be located. Predefined ports must be assigned for enabling the communication between the customer application servers and utility application servers to facilitate the access/transfer of data.
25. Bidders must ensure that Smart city data centers are well equipped with adequate security controls to protect the confidentiality, integrity and accessibility of critical data. The center should consider including cyber security systems such as firewalls, Intrusion detection & Intrusion prevention systems, Web Application Firewalls, Behavioural analysis systems for anomaly detection, Correlation engine, Denial of Service prevention device, Advanced Persistent Threat notification mechanism, Federated identity, access management system etc.
26. Bidders must ensure that the Smart city cyber security infrastructure incorporates high level security and monitoring controls such as SIEM (Security Information and Event Management) tools on all networks, field devices and sensors to identify malicious traffic.

27. Bidders must ensure all smart city applications must be hosted within India and must undergo static and dynamic security testing before deployment. Also, the applications must be periodically (at least once a year) tested for adequate security control.
28. Bidders must ensure that the proposed smart city architecture provides for:
  - a. Automatic and secure firmware updates
  - b. Device logging and auditing capabilities
  - c. Vendor self-certification for non-existence of backdoors, undocumented and hard coded accounts.
29. Bidders must ensure that all the information on security incidents is regularly shared with Indian Computer Emergency Response Team (CERT-In) and NCIIPC (National Critical Information Infrastructure Protection Center) and their help is sought for appropriate mitigation and recovery from the security incidents.
30. Bidders shall ensure that Data encryption at rest shall be implemented using departments managed keys, which are not stored in the cloud.
31. The bidder shall setup Cyber Security Continuous Monitoring process to monitor - physical environment, External service provider activity etc. to detect potential cyber security incidents.

#### **12.9. Information Systems Acquisition, Development and Maintenance**

1. The Bidder shall prepare the detailed technical security requirement as part of the 'Software Requirement Specification' document with secure coding guidelines for development of applications for smart city.
2. The Bidder shall incorporate validation checks into smart city applications to detect any corruption of information through processing errors or deliberate acts.
3. The Bidder shall obtain information about technical vulnerabilities of information systems being used in smart city, evaluate the exposure to such vulnerabilities, and take appropriate measures to address the associated risk.
4. The bidder shall implement maintenance and repair process of smart city IT assets in timely manner, with approved and controlled tools.

#### **12.10. Business Continuity Planning and Disaster Recovery**

1. The Bidder shall implement and operate Disaster Recovery site for the Smart city infrastructure and related IT & OT applications. IT & OT applications and processes should be supported from the disaster recovery site.
2. The Bidder shall define Business Continuity and Disaster Recovery plan and shall perform the testing on a half yearly basis

#### **12.11. Information Security Audits**

The bidder shall ensure Information security audits of the smart city infrastructure and related applications by a CERT-In empaneled vendor. VA/PT (Vulnerability assessment and Penetration Testing) activities, audits and application security testing must be carried out on twice-a-year basis

ensuring optimal operation and security of the smart city infrastructure and applications. Teams carrying out the audit exercise must be different from the implementation teams. Systematic actionable need to be derived post audits and necessary changes need to be made periodically.

#### **12.12. Security Operations Center**

The bidder shall set up Security Operations Center to ensure continuous monitoring and manage all kinds of cyber security operations related to smart city such as Incident Management, Logging and Monitoring, Anti-virus Management, Threat Intelligence Support, Secure Technology Disposal and other cyber security support activities to ensure secured smart city ecosystem.

#### **12.13. Awareness Training**

The bidder shall deploy appropriate resources to support periodic awareness training based on latest standards of ISMS. The trainings must focus on educating relevant employees (including privileged users, third party, senior management etc.) on necessary security practices and processes to be followed in order to maintain the Confidentiality, Integrity and Availability of critical data.

#### **12.14. Security Controls for Cloud Services**

The security controls for creating and managing cloud services shall comply with the following guidelines.

Empanelment of Cloud Service Offerings CSPs facilities/services shall be compliant with regulative directives and industry best practices. The SLA shall be based on the guidelines issued by Government Departments on contractual terms related to Cloud Services (MeitY guideline dated 31/03/17). The security controls should include the following:

- a. The CSP should be empanelled by MeitY for providing cloud services. The CSPs facilities/services shall be certified to be compliant to the following standards: ISO 27001, ISO 27017, ISO 27018, ISO 20000-9, ISO/IEC 20000-1 & PCI DSS.
- b. The CSP/Service Provider shall comply or meet any security requirements applicable to CSPs/Service Providers published (or to be published) by MeitY or any standards body setup / recognized by Government of India from time to time and notified to the CSP/Service Providers by MeitY as a mandatory standard.
- c. The CSP/Service Provider shall meet all the security requirements indicated in the IT Act 2000, the terms and conditions of the Provisional Empanelment of the Cloud Service Providers and shall comply with the audit criteria defined by STQC.
- d. Incident Management shall be managed by CSP / third party.
- e. Periodic secure code review shall be performed for cloud applications.
- f. Data encryption at rest / transit depending on sensitivity of data shall be implemented using departments managed keys, which are not stored on the cloud.
- g. The CSP shall undertake to treat information passed on to them as classified. Such Information shall not be communicated / published / advertised by the CSP to any person/organization without the express permission of the Department.
- h. CSP shall inform all security breach incidents to Smart City management on real time.
- i. CSP shall ensure data confidentiality and mention Sub-contractual risk shall be covered by CSP.

- j. E-Discovery shall be included as clause in SLA with CSP. It is the process of locating, preserving, collecting, processing, reviewing, and producing Electronically Stored Information (ESI) in the context of or criminal cases/proceedings or investigation. Logging and reporting (e.g., audit trails of all access and the ability to report on key requirements/indicators) must be ensured.
- k. The Law Enforcement Agency as mandated under any law for the time being in force may seek access to information stored on cloud as provided by the Service Provider. The onus shall be on the CSP to perform all due diligence before releasing any such information to any such law enforcement agency.
- l. CSP must ensure location of all data related to smart cities in India only.
- m. The Cloud Service Provider's services offerings shall comply with the audit requirements defined under the terms and conditions of the Provisional Empanelment of the Cloud Service Providers (or STQC /MEITY guidelines. The Audit, Access and Reporting Requirements should be as per the terms and conditions of the Provisional Empanelment of the Cloud Service.
- n. CSP's exit Management Plan shall include - Transition of Managed Services & Migration from the incumbent cloud service provider's environment to the new environment and shall follow all security clauses for smooth transition.
- o. SLA with CSP shall cover performance management & dispute resolution escalation. Guidelines on Service Level Agreement issued by MeitY lists out the critical SLAs for cloud services.
- p. Identification and problem resolution (e.g., helpline, call center, or ticketing system) mechanism must be defined.
- q. Change-management process (e.g., changes such as updates or new services) must be defined.
- r. Appropriate segregation of Virtual Private Cloud (VPC) security rules defined as part of firewall to restrict access, Role based access management, Logging and monitoring shall be ensured.
- s. VPN gateway must be setup to ensure controlled access, appropriate security rules must be employed to encrypt outward data flow, IDS, IPS, API Gateways to be setup and ELB logs to be maintained for any activities and access and exceptions to carried out in the cloud setup, Database logs to be routed as part of the Logging VPC setup.
- t. Digital Certificate shall be implemented for secure access.
- u. Web Application Firewall must be provided, Host IPS must be setup on all the Web servers, Web servers must be configured as per the CIS hardening guidelines and baseline security requirements, logging and monitoring should be enabled.
- v. Application access between hosted smart city applications shall be segregated, internal infrastructure and external traffic, Role based access must be defined, hardening of database instances as per the CIS baselines configuration guidelines in the cloud setup must be ensured, Logging and monitoring must be enabled.
- w. For SLAs to be used to steer the behaviour of a cloud services provider, imposition of financial penalties is to be incorporated.

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- x. Monitor Vendor Service level agreement for annual end-to-end service availability of 99.999 percent. The end to end service agreement should be in place for minimum period of six years form the date of operations of the systems.

## **13. Annexure VIII- Existing Infrastructure**

### **13.1. Existing Traffic Signals**

<b>S. No.</b>	<b>Name of Junction</b>
1.	Dhobhi Ghat Chouraha
2.	Government Press Chouraha/Eklavya Chouraha
3.	Hanuman Mandir Chouraha
4.	Medical Chouraha
5.	Mayo Hall Chouraha/Rana Pratap Chouraha
6.	Subhash Chouraha
7.	Yatrik Hotel Chouraha
8.	Hot Stuff Chouraha
9.	Balson Chouraha
10.	Bus Stand Chauraha
11.	Bairhana Chouraha
12.	Bajaj Auto Chouraha
13.	Hindu Hostel Chouraha
14.	Collectorate Chauraha
15.	Mishra Bhawan Chouraha
16.	Rambagh Sundaram Tower Chauraha
17.	Auto Stand Teliyarganj
18.	Traffic Line Chauraha
19.	Indira Murthi Chouraha

S. No.	Name of Junction
20.	Lok Sewa Aayog Chouraha
21.	MNIT Chauraha

### **13.2. Existing E-Governance Modules**

The key e-governance services operational for Allahabad Citizens are mentioned below:

1. Online Property Tax Collection
2. Online Water Connection
3. Online mutation of Property
4. Online Trade License
5. Online Birth & Death Registration
6. Online Assessment of Property

The detailed description of above mentioned online services are mentioned below:

S. No.	Service	Type	Brief Description	URL	Mobile App	Hosting details	Hosting Location
1.	Online Property Tax Collection	State Level	Online Property Tax payment for Citizen	<a href="https://e-nagarsew aup.gov.in /onlinepa y/">https://e-nagarsew aup.gov.in /onlinepa y/</a>	Google Play Store Citizen app to track applications at eNagarSewa	<ul style="list-style-type: none"> <li>• Implemented at State data Center</li> <li>• 11 blade servers</li> <li>• Webservers are in active-active mode</li> <li>• HA is active</li> <li>• OS: RHEL 6.</li> <li>• Mod cluster for HA</li> </ul>	State Data Center, Lucknow
2.	Online Water Connection	State Level	Citizen can apply for online water & Sewerage connection	<a href="https://e-nagarse waup.gov.in/onli nepay/">https://e-nagarse waup.gov.in/onli nepay/</a>	Google Play Store Citizen app to track applications at eNagarS	<ul style="list-style-type: none"> <li>• Oracle 11GR2 in grid with two db in cluster</li> <li>• Transaction: 45 Lakhs transactions/Hits</li> </ul>	State Data Center, Lucknow

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S. No.	Service	Type	Brief Description	URL	Mobile App	Hosting details	Hosting Location
			on & can pay fee online.		ewa		
3.	Online Mutation of property	State Level	Citizen can apply for online Mutation of property & can pay fee online.	<a href="https://e-nagarsewaup.gov.in/onlinenepay/">https://e-nagarsewaup.gov.in/onlinenepay/</a>	Google Play Store Citizen app to track applications at eNagarSewa		State Data Center, Lucknow
4.	Online Trade Licence	State Level	Citizen can apply for the Online trade licence & can pay fee online.	<a href="https://e-nagarsewaup.gov.in/onlinenepay/">https://e-nagarsewaup.gov.in/onlinenepay/</a>	Google Play Store Citizen app to track applications at eNagarSewa		State Data Center, Lucknow
5.	Birth & Death Registration - Online	State Level	Citizen can apply for the online birth& Death Registration & can pay fee online.	<a href="https://e-nagarsewaup.gov.in/onlinenepay/">https://e-nagarsewaup.gov.in/onlinenepay/</a>	Google Play Store Citizen app to track applications at eNagarSewa		State Data Center, Lucknow



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S. No.	Service	Type	Brief Description	URL	Mobile App	Hosting details	Hosting Location
6.	Assessment of property – Online	State Level	Citizen can do assessment for the property & can pay fee online.	<a href="https://e-nagarsewaup.gov.in/onlinepay/">https://e-nagarsewaup.gov.in/onlinepay/</a>	Google Play Store Citizen app to track applications at eNagarSewa		State Data Center, Lucknow

**13.3. Technical Specifications of existing GPS based Vehicle Tracking System (VTS) installed in Allahabad Municipal Corporation Buses**

S. No.	Parameter	Specifications
1.	Dimensions	78.4mm x 45.4 mm x 16.5mm
2.	Weight	40g
3.	Network	GSM/GPRS
4.	Band	850/1800/1900Mhz or 900/1800/1900Mhz
5.	GPS chip	U-BLOX-5 chip
6.	GSM/GPRS module	Siemens MC55 or Siemens MC56
7.	GPS sensitivity	-159dBm
8.	GPS accuracy	5m
9.	Time To First Fix	Reacquisition 0.1s Cold status 45s Warm status 35s Hot status 1s

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S. No.	Parameter	Specifications
10.	Charger	12—24V input, 5V output
11.	Battery	Chargeable changeable 3.7V 600mAh Li-ion battery
12.	Standby	50 hours
13.	Backup	3-5 hours
14.	Storage Temp.	-40°C to +85°C
15.	Operation Temp.	-20°C to +55°C
16.	Humidity	5%--95% non-condensing
17.	Antenna	Internal (Built In)
18.	I/O	2 Digital Input and 1 Digital O/P
19.	Fuel Monitoring	No
20.	Data Storage	600 Points

**13.4. Location of Existing Poles for installation of new traffic signals**

S. No.	Name of Junction	Cantilever Poles	Standard Poles
1.	Traffic Line Chauraha	4	4
2.	Salikram Jaiswal Chauraha/Railway Station City Side	4	4
3.	Rambagh Datpul	6	6
4.	Medical Chauraha	4	4
5.	Manmohan Pratima Chauraha	5	5
6.	GT Jawahar Chauraha	5	5
7.	Dhobhighat Chauraha	4	4

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S. No.	Name of Junction	Cantilever Poles	Standard Poles
8.	Balson Chauraha	5	5
9.	Maharana Pratab Chauraha	5	5

## 14. Annexure IX- List of Locations

### 14.1. Locations of City Surveillance System for Temporary Infrastructure for Phase 1

S. No.	Area Type	Location Name	Latitude	Longitude	PTZ	ANPR	Fixed Box Cameras	Location for DC Location	Location of CCC/ICCC Location
1	Kumbh/P arade Area	Kali - Lal sadak Holdup	25°26'21.91"N	81°52'39.09"E	1	0	0	KM CCC	KM CCC
2		Kali Sadak Extension Holdup	25°26'29.33"N	81°52'12.42"E	1	0	0	KM CCC	KM CCC
3		Shastri bridge aproch marg (wapsi marg) pul ke upar	25°26'28.49"N	81°52'35.21"E	0	0	3	KM CCC	KM CCC
4		Triveni road pradarshni ke pass	25°26'10.43"N	81°52'0.05"E	2	0	0	KM CCC	KM CCC
5		Naya Yamuna bridge Triveni road crossing	25°25'57.03"N	81°51'39.26"E	0	0	3	KM CCC	KM CCC
6		Triveni Road Kacha Marg Tiraha	Exact Location would be finalized post selection of bidder	Exact Location would be finalized post selection of bidder	1	0	0	KM CCC	KM CCC
7		Flyover Alopi Bagh Middle	25°26'36.52"N	81°52'1.10"E	0	0	2	KM CCC	KM CCC
8		Shanker lal Bhargava marg	25°26'19.46"N	81°52'12.77"E	0	0	2	KM CCC	KM CCC

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S. No.	Area Type	Location Name	Latitude	Longitude	PTZ	ANPR	Fixed Box Cameras	Location for DC Location	Location of CCC/ICCC Location
9		Saraswati ghat	25°25'50.55"N	81°52'7.42"E	1	0	0	KM CCC	KM CCC
10		Kila ke ander ka kshetra	25°25'46.45"N	81°52'36.82"E	5	0	0	KM CCC	KM CCC
11		Flyover Alop Bagh Paschimi Ramp	25°26'40.29"N	81°51'58.46"E	0	0	1	KM CCC	KM CCC
12	<b>Kumbh/Sangam Area</b>	Triveni road kila sarak crossing	25°26'10.25"N	81°52'49.18"E	0	0	4	KM CCC	KM CCC
13		Kali sarak kila road crossing	25°26'16.43"N	81°52'52.63"E	0	0	4	KM CCC	KM CCC
14		Jagdish kila road crossing	25°26'2.39"N	81°52'45.80"E	0	0	4	KM CCC	KM CCC
15		Kila road Mahaveer ji Tiraha	25°25'57.05"N	81°52'44.01"E	0	0	3	KM CCC	KM CCC
16		Akshayvat crossing	25°25'49.54"N	81°52'42.06"E	1	0	5	KM CCC	KM CCC
17		Kila ghat se Yamuna sangam patti	25°25'42.51"N	81°52'52.13"E	5	0	0	KM CCC	KM CCC
18		Sangam circulating area	25°25'37.67"N	81°53'18.74"E	3	0	3	KM CCC	KM CCC

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S. No.	Area Type	Location Name	Latitude	Longitude	PTZ	ANPR	Fixed Box Cameras	Location for DC Location	Location of CCC/ICCC Location
19		Ganga sangam patti poorvi & pachimi sabhi snan ghat	Exact Location would be finalized post selection of bidder	Exact Location would be finalized post selection of bidder	15	0	0	KM CCC	KM CCC
20		Mahaveer road sangam road crossing	25°25'53.09"N	81°52'52.67"E	1	0	4	KM CCC	KM CCC
21		Jagdish road sangam road crossing	25°25'58.95"N	81°52'53.07"E	1	0	3	KM CCC	KM CCC
22		Akshayavat road sangam road crossing	25°25'45.96"N	81°52'51.76"E	1	0	3	KM CCC	KM CCC
23		Triveni road sangam road crossing	25°26'8.16"N	81°52'53.20"E	1	0	4	KM CCC	KM CCC
24		Kali road sangam road crossing	25°26'14.74"N	81°52'55.31"E	1	0	4	KM CCC	KM CCC
25		Akshayvat road VIP road crossing	25°25'46.25"N	81°52'51.06"E	1	0	2	KM CCC	KM CCC
26		Mahaveer ji VIP road crossing	25°25'53.36"N	81°52'52.06"E	1	0	2	KM CCC	KM CCC
27		Mori road Sangam Road Crossing	Exact Location would be finalized post	Exact Location would be finalized	1	0	0	KM CCC	KM CCC

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S. No.	Area Type	Location Name	Latitude	Longitude	PTZ	ANPR	Fixed Box Cameras	Location for DC Location	Location of CCC/ICCC Location
			selection of bidder	post selection of bidder					
28		Mori ramp	25°26'21.10"N	81°52'54.40"E	2	0	0	KM CCC	KM CCC
29		Peepapul 01 se 22 tak pashchimi chhor	Exact Location would be finalized post selection of bidder	Exact Location would be finalized post selection of bidder	44	0	0	KM CCC	KM CCC
30		Nagwasuki Ramp	25°27'17.59"N	81°52'55.20"E	1	0	0	KM CCC	KM CCC
31		Nagvasuki mod	25°27'17.68"N	81°52'58.44"E	0	0	2	KM CCC	KM CCC
32		Gangeshwar mahadev marg Kailash puri marg	25°29'4.34"N	81°52'45.14"E	1	0	2	KM CCC	KM CCC
33		Bhradwaj marg bajrang das marg crossing	25°27'17.03"N	81°53'5.73"E	0	0	3	KM CCC	KM CCC
34		Central Control tower (CCTV)	25°25'36.30"N	81°53'23.78"E	2	0	0	KM CCC	KM CCC
35		Akhada marg (akhada formation & akhada camping sthal ke Madhya	25°26'1.61"N	81°52'52.70"E	10	0	0	KM CCC	KM CCC

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S. No.	Area Type	Location Name	Latitude	Longitude	PTZ	ANPR	Fixed Box Cameras	Location for DC Location	Location of CCC/ICCC Location
36	<b>Kumbh/A rail Area</b>	Thana Naini bridge	25°25'21.68"N	81°51'43.07"E	2	0	1	KM CCC	KM CCC
37		Arail ghat	25°25'13.64"N	81°52'50.15"E	2	0	0	KM CCC	KM CCC
38		Saccha baba ashram Mod	25°25'11.58"N	81°52'55.13"E	1	0	0	KM CCC	KM CCC
39		Saccha baba ashram	25°25'11.58"N	81°52'55.13"E	0	0	1	KM CCC	KM CCC
40		Saccha baba ashram ke peeche	25°25'7.12"N	81°53'1.47"E	0	0	1	KM CCC	KM CCC
41		Someshwar Mahadev mandir	25°24'25.49"N	81°53'27.64"E	1	0	1	KM CCC	KM CCC
42		Devrakh ghat	25°24'15.97"N	81°53'34.48"E	1	0	0	KM CCC	KM CCC
43		DPS tiraha/Omaxe Anand tiraha	25°23'56.63"N	81°53'46.16"E	0	0	4	KM CCC	KM CCC
44		Asha Ram Babu Ashram	25°23'37.90"N	81°53'57.05"E	1	0	0	KM CCC	KM CCC
45		Kharkauni Mod	25°24'30.19"N	81°51'53.09"E	0	0	1	KM CCC	KM CCC



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S. No.	Area Type	Location Name	Latitude	Longitude	PTZ	ANPR	Fixed Box Cameras	Location for DC Location	Location of CCC/ICCC Location
46		Ganjiya mod	25°25'2.05"N	81°52'12.92"E	0	0	2	KM CCC	KM CCC
47		Arail mod tiraha/Dandi Chauraha	25°24'8.88"N	81°52'9.84"E	1	0	3	KM CCC	KM CCC
48		Bethani convent mod	25°24'20.87"N	81°52'7.34"E	0	0	1	KM CCC	KM CCC
49		Sabji Mandi Tiraha	25°23'49.54"N	81°51'51.77"E	0	0	1	KM CCC	KM CCC
50		Cotton Mil Tiraha	25°24'1.37"N	81°52'4.25"E	0	0	1	KM CCC	KM CCC
51		Sandwan Tiraha	25°21'52.62"N	81°52'50.47"E	0	0	1	KM CCC	KM CCC
52		Chheoki Railway Station Tiraha	25°22'43.71"N	81°52'17.59"E	1	0	2	KM CCC	KM CCC
53	<b>Kumbh/North Jhunsi</b>	Gangeshwar Mahadev marg lower sangam crossing	Exact Location would be finalized post selection of bidder	Exact Location would be finalized post selection of bidder	1	0	4	KM CCC	KM CCC
54		Bhardwaj marg lower sangam crossing	Exact Location would be finalized post	Exact Location would be finalized	1	0	4	KM CCC	KM CCC

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S. No.	Area Type	Location Name	Latitude	Longitude	PTZ	ANPR	Fixed Box Cameras	Location for DC Location	Location of CCC/ICCC Location
			selection of bidder	post selection of bidder					
55		Nagvasuki marg lower sangam crossing	Exact Location would be finalized post selection of bidder	Exact Location would be finalized post selection of bidder	1	0	4	KM CCC	KM CCC
56		Harishchandra marg lower sangam crossing	Exact Location would be finalized post selection of bidder	Exact Location would be finalized post selection of bidder	1	0	4	KM CCC	KM CCC
57		Old G.T. road lower sangam crossing	Exact Location would be finalized post selection of bidder	Exact Location would be finalized post selection of bidder	1	0	4	KM CCC	KM CCC
58		Gangauli Shivala lower sangam crossing	Exact Location would be finalized post selection of bidder	Exact Location would be finalized post selection of bidder	1	0	4	KM CCC	KM CCC
59		Mori marg lower sangam crossing	Exact Location would be finalized post	Exact Location would be finalized	1	0	4	KM CCC	KM CCC

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S. No.	Area Type	Location Name	Latitude	Longitude	PTZ	ANPR	Fixed Box Cameras	Location for DC Location	Location of CCC/ICCC Location
			selection of bidder	post selection of bidder					
60		Annapurna marg Nagvasuki crossing	Exact Location would be finalized post selection of bidder	Exact Location would be finalized post selection of bidder	1	0	4	KM CCC	KM CCC
61		Shankaracharya marg bhardwaj crossing	Exact Location would be finalized post selection of bidder	Exact Location would be finalized post selection of bidder	1	0	4	KM CCC	KM CCC
62		Gangeshwar marg Shankaracharya marg crossing	Exact Location would be finalized post selection of bidder	Exact Location would be finalized post selection of bidder	1	0	4	KM CCC	KM CCC
63		Harshavardhan marg bhardwaj crossing	Exact Location would be finalized post selection of bidder	Exact Location would be finalized post selection of bidder	1	0	4	KM CCC	KM CCC
64		Mukti marg bhardwaj crossing	Exact Location would be finalized post	Exact Location would be finalized	1	0	4	KM CCC	KM CCC

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S. No.	Area Type	Location Name	Latitude	Longitude	PTZ	ANPR	Fixed Box Cameras	Location for DC Location	Location of CCC/ICCC Location
			selection of bidder	post selection of bidder					
65		Old G.T. road mansaeita nala ramp	25°26'30.54"N	81°54'17.07"E	1	0	4	KM CCC	KM CCC
66		Mukti marg old G.T. crossing	Exact Location would be finalized post selection of bidder	Exact Location would be finalized post selection of bidder	1	0	4	KM CCC	KM CCC
67		Mukti marg mori marg crossing	Exact Location would be finalized post selection of bidder	Exact Location would be finalized post selection of bidder	1	0	4	KM CCC	KM CCC
68		Tulsi marg Nagvasuki marg crossing	Exact Location would be finalized post selection of bidder	Exact Location would be finalized post selection of bidder	1	0	4	KM CCC	KM CCC
69	<b>Kumbh/South Jhunsi</b>	G.T chatnag mod	25°26'33.29"N	81°52'3.83"E	1	0	3	KM CCC	KM CCC
70		Milan chauraha	25°24'47.54"N	81°55'2.42"E	1	0	2	KM CCC	KM CCC

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S. No.	Area Type	Location Name	Latitude	Longitude	PTZ	ANPR	Fixed Box Cameras	Location for DC Location	Location of CCC/ICCC Location
71		Chatnag ghat	25°24'35.78"N	81°54'25.52"E	2	0	0	KM CCC	KM CCC
72		Chatnag ramp (shamshan ghat)	25°24'35.78"N	81°54'25.52"E	0	0	2	KM CCC	KM CCC
73		Chatnag ramp se Bhajnanand ashram tak	25°24'53.46"N	81°54'17.56"E	2	0	0	KM CCC	KM CCC
74		G.T road - Kriya yog ashram mod	25°25'54.91"N	81°54'7.16"E	0	0	3	KM CCC	KM CCC
75		G.T. road - Tikarmafi mod	25°25'52.33"N	81°54'11.61"E	0	0	3	KM CCC	KM CCC
76		Samudracoop mod	25°25'43.53"N	81°54'11.42"E	1	0	3	KM CCC	KM CCC
77		Tikarmafi ramp	25°25'45.32"N	81°53'58.95"E	1	0	4	KM CCC	KM CCC
78		Satuya baba ramp	25°25'43.76"N	81°54'5.00"E	0	0	2	KM CCC	KM CCC
79		Samudracoop ramp	25°25'43.53"N	81°54'11.42"E	0	0	2	KM CCC	KM CCC
80		Homegurad tiraha	25°26'18.45"N	81°54'26.76"E	0	0	3	KM CCC	KM CCC

**Request for Proposal (RFP) for Selection of Master System Integrator (MSI) for Implementation of Integrated Command & Control Center (ICCC) in Allahabad City**

S. No.	Area Type	Location Name	Latitude	Longitude	PTZ	ANPR	Fixed Box Cameras	Location for DC Location	Location of CCC/ICCC Location
81		Roadways tiraha	25°26'8.29"N	81°55'31.23"E	1	0	3	KM CCC	KM CCC
82		Kali road lower sangam crossing	Exact Location would be finalized post selection of bidder	Exact Location would be finalized post selection of bidder	1	0	4	KM CCC	KM CCC
83		Triveni road lower sangam crossing	Exact Location would be finalized post selection of bidder	Exact Location would be finalized post selection of bidder	1	0	4	KM CCC	KM CCC
84		Jagdish road lower sangam crossing	Exact Location would be finalized post selection of bidder	Exact Location would be finalized post selection of bidder	1	0	4	KM CCC	KM CCC
85		Mahavir road lower sangam crossing	Exact Location would be finalized post selection of bidder	Exact Location would be finalized post selection of bidder	1	0	4	KM CCC	KM CCC
86		Akshyavat road lower sangam crossing	Exact Location would be finalized post	Exact Location would be finalized	1	0	4	KM CCC	KM CCC

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S. No.	Area Type	Location Name	Latitude	Longitude	PTZ	ANPR	Fixed Box Cameras	Location for DC Location	Location of CCC/ICCC Location
			selection of bidder	post selection of bidder					
87		Sursari marg lower sangam crossing	Exact Location would be finalized post selection of bidder	Exact Location would be finalized post selection of bidder	1	0	4	KM CCC	KM CCC
88		Ganga prasar chhetra	Exact Location would be finalized post selection of bidder	Exact Location would be finalized post selection of bidder	4	0	0	KM CCC	KM CCC
89		Kali road mukti marg crossing	Exact Location would be finalized post selection of bidder	Exact Location would be finalized post selection of bidder	1	0	2	KM CCC	KM CCC
90		Mahavir ji marg mukti marg crossing	Exact Location would be finalized post selection of bidder	Exact Location would be finalized post selection of bidder	1	0	3	KM CCC	KM CCC
91		Mahavir road ramanand crossing	Exact Location would be finalized post	Exact Location would be finalized	1	0	3	KM CCC	KM CCC

**Request for Proposal (RFP) for Selection of Master System Integrator (MSI) for Implementation of Integrated Command & Control Center (ICCC) in Allahabad City**

S. No.	Area Type	Location Name	Latitude	Longitude	PTZ	ANPR	Fixed Box Cameras	Location for DC Location	Location of CCC/ICCC Location
			selection of bidder	post selection of bidder					
92		Akshyavat road ramanand crossing	Exact Location would be finalized post selection of bidder	Exact Location would be finalized post selection of bidder	1	0	3	KM CCC	KM CCC
93	<b>Railway Station</b>	INFRONT OF EIGHTH MARG, NY Road	25°26'55.16"N	81°49'33.33"E	1	0	2	KM CCC	KM CCC
94		INFRONT OF SEVENTH MARG, NY Road	25°26'54.35"N	81°49'38.51"E	1	0	3	KM CCC	KM CCC
95		INFRONT OF SIXTH MARG, NY Road	25°26'53.41"N	81°49'41.87"E	1	0	3	KM CCC	KM CCC
96		INFRONT OF FIFTH MARG, NY Road	25°26'53.01"N	81°49'45.37"E	1	0	3	KM CCC	KM CCC
97		INFRONT OF FOURTH MARG, NY Road	25°26'52.72"N	81°49'49.26"E	1	0	3	KM CCC	KM CCC
98		INFRONT OF THIRD MARG, NY Road	25°26'52.37"N	81°49'51.99"E	1	0	3	KM CCC	KM CCC
99		INFRONT OF GALI1-AFTER THIRD MARG	25°26'51.95"N	81°49'53.01"E	0	0	1	KM CCC	KM CCC



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S. No.	Area Type	Location Name	Latitude	Longitude	PTZ	ANPR	Fixed Box Cameras	Location for DC Location	Location of CCC/ICCC Location
100		INFRONT OF GALI2-AFTER THIRD MARG	25°26'51.90"N	81°49'55.44"E	0	0	1	KM CCC	KM CCC
101		INFRONT OF SECOND MARG,NY ROAD	25°26'51.78"N	81°49'58.34"E	1	0	1	KM CCC	KM CCC
102		INFRONT OF GALI 3-AFTER SECOND MARG	25°26'51.64"N	81°50'0.55"E	0	0	2	KM CCC	KM CCC
103		INFRONT OF FIRST MARG, NY ROAD	25°26'50.92"N	81°50'2.72"E	1	0	1	KM CCC	KM CCC
104		INFRONT OF GALI 4-AFTER DRM OFFICE	25°26'50.78"N	81°50'10.45"E	1	0	1	KM CCC	KM CCC
105		Pul K Pehle Ki Gali	25°26'37.30"N	81°50'13.57"E	1	0	1	KM CCC	KM CCC
106		Petrol Pump K Paas Wali Gali	25°26'44.34"N	81°50'19.90"E	1	0	2	KM CCC	KM CCC
107		MalGodam Gali	25°26'35.22"N	81°50'5.82"E	0	0	1	KM CCC	KM CCC
108		PetrolPump K Pehle Wali Gali	25°26'36.09"N	81°49'54.48"E	0	0	1	KM CCC	KM CCC
109		GRP Line KE Baad Gali 1	25°26'41.74"N	81°49'14.64"E	0	0	1	KM CCC	KM CCC

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S. No.	Area Type	Location Name	Latitude	Longitude	PTZ	ANPR	Fixed Box Cameras	Location for DC Location	Location of CCC/ICCC Location
110		GRP Line KE Baad Gali 2	25°26'42.04"N	81°49'9.86"E	0	0	1	KM CCC	KM CCC
111		DSA Ground Hold up	25°26'43.91"N	81°49'0.84"E	1	0	0	KM CCC	KM CCC
112		Pani Tanki Chauraha se pehle wali gali1	25°26'58.41"N	81°49'3.18"E	0	0	1	KM CCC	KM CCC
113		Pani Tanki Chauraha se pehle wali gali2	25°26'58.31"N	81°49'7.07"E	0	0	1	KM CCC	KM CCC
114		NINTH MARG	25°26'55.83"N	81°49'22.27"E	0	0	1	KM CCC	KM CCC
115	<b>North Jhunsi Parking Area</b>	Chinimill Parking	25°26'11.09"N	81°54'49.68"E	1	1	0	KM CCC	KM CCC
116		Poore Soordas Parking	25°26'51.52"N	81°54'46.18"E	1	0	0	KM CCC	KM CCC
117	<b>South Jhunsi Parking Area</b>	Mahuabagh Parking	25°25'47.23"N	81°54'26.68"E	1	1	0	KM CCC	KM CCC
118		HRI ke Samne Parking	25°24'37.57"N	81°54'31.32"E	1	1	0	KM CCC	KM CCC
119		Nath Nageshwar Ghat(yadav tiraha parking)	25°24'17.97"N	81°54'39.94"E	1	0	0	KM CCC	KM CCC

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S. No.	Area Type	Location Name	Latitude	Longitude	PTZ	ANPR	Fixed Box Cameras	Location for DC Location	Location of CCC/ICCC Location
120	<b>Arail Area Parking Area</b>	Nauprayagam Parking	25°25'47.75"N	81°51'40.98"E	1	1	0	KM CCC	KM CCC
121		Ganjiya Ganv	25°25'2.05"N	81°52'12.92"E	1	0	0	KM CCC	KM CCC
122		Devraakh Upehaar Parking	25°24'14.28"N	81°53'25.87"E	1	0	0	KM CCC	KM CCC
123	<b>City Area Parking Area</b>	Plot No.17 Parking	25°26'23.82"N	81°51'58.88"E	1	1	0	KM CCC	KM CCC
124		Karyashala Peepapul Parking	25°26'23.63"N	81°52'22.38"E	1	1	0	KM CCC	KM CCC
125		Dadhikandho Maidan Parking	25°25'52.66"N	81°51'33.69"E	1	1	0	KM CCC	KM CCC
126		Galla Mandi Baghambari Road Parking	25°26'30.35"N	81°52'46.58"E	1	1	0	KM CCC	KM CCC
127		Bada Baghada Kachar Parking	25°27'58.08"N	81°52'40.40"E	1	0	0	KM CCC	KM CCC

**14.2. Locations for Temporary Variable Message Display (VMD) for Kumbh Mela - 2019**

S. No.	Location Name	Latitude	Longitude	Location for DC Location	Location of CCC/ICCC Location
1.	Kali Sadak Tiraha Parade (barricading)/Banghad Dharmshala	25°26'24.74"N	81°51'47.18"E	KM CCC	KM CCC
2.	Kali Ramp	25°26'17.24"N	81°52'50.90"E	KM CCC	KM CCC
3.	Sangam Circulating Wapasi Marg- 4 Nos	25°25'37.05"N	81°53'15.48"E	KM CCC	KM CCC
4.	Akshayvat Peepapul side	25°25'47.29"N	81°53'10.32"E	KM CCC	KM CCC
5.	Mahaveer ji Peepapul side	25°25'55.92"N	81°53'2.09"E	KM CCC	KM CCC
6.	Zero PeepaPul-sangam side	25°26'0.74"N	81°52'58.95"E	KM CCC	KM CCC
7.	Daraganj sabji mandi tiraha	25°26'38.43"N	81°53'4.27"E	KM CCC	KM CCC
8.	Nagwasuki Mod	25°27'17.59"N	81°52'55.20"E	KM CCC	KM CCC
9.	Medical Chouraha	25°26'49.08"N	81°51'5.11"E	KM CCC	KM CCC
10.	CMP Digree college dot pul	25°26'40.13"N	81°51'34.52"E	KM CCC	KM CCC
11.	Kali Sangam Tiraha	25°26'15.29"N	81°52'54.60"E	KM CCC	KM CCC

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S. No.	Location Name	Latitude	Longitude	Location for DC Location	Location of CCC/ICCC Location
12.	Tikarmafi mod	25°25'51.07"N	81°54'0.68"E	KM CCC	KM CCC
13.	Kriyayog Mod	25°25'54.24"N	81°54'7.24"E	KM CCC	KM CCC
14.	Chhatnag Mod	25°25'36.27"N	81°55'15.08"E	KM CCC	KM CCC
15.	Milan Chauraha	25°25'15.45"N	81°55'5.53"E	KM CCC	KM CCC
16.	Jhunsi Garapur Marg Mod	25°26'6.21"N	81°54'53.93"E	KM CCC	KM CCC
17.	Peepa Pul Mukti Someshwar Marg Mod	25°25'21.52"N	81°53'45.23"E	KM CCC	KM CCC
18.	Leprosy Chauraha Naini Station Tiraha	25°23'49.54"N	81°51'51.77"E	KM CCC	KM CCC
19.	Leprosy Chauraha	25°24'51.72"N	81°51'25.90"E	KM CCC	KM CCC
20.	Harshvardhan Chauraha	25°26'2.78"N	81°51'39.38"E	KM CCC	KM CCC
21.	Geeta Niketan	25°26'41.51"N	81°51'57.50"E	KM CCC	KM CCC
22.	GT Jawahar	25°26'32.04"N	81°52'4.19"E	KM CCC	KM CCC

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S. No.	Location Name	Latitude	Longitude	Location for DC Location	Location of CCC/ICCC Location
23.	Andhawa Chauraha	25°25'40.20"N	81°56'5.85"E	KM CCC	KM CCC
24.	Mori Ramp	25°26'21.10"N	81°52'54.40"E	KM CCC	KM CCC
25.	Bairahana	25°26'22.94"N	81°51'38.85"E	KM CCC	KM CCC
26.	Bai ka bagh	25°26'14.72"N	81°51'7.44"E	KM CCC	KM CCC
27.	Bank road - Cymetry road tiraha	Exact Location would be finalized post selection of bidder	Exact Location would be finalized post selection of bidder	KM CCC	KM CCC
28.	Mawaiya mod	Exact Location would be finalized post selection of bidder	Exact Location would be finalized post selection of bidder	KM CCC	KM CCC
29.	DPS Mod	25°23'56.63"N	81°53'46.16"E	KM CCC	KM CCC
30.	Arail mod	Exact Location would be finalized post selection of bidder	Exact Location would be finalized post selection of bidder	KM CCC	KM CCC
31.	Sangam petrol pump	25°26'53.05"N	81°51'48.49"E	KM CCC	KM CCC

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S. No.	Location Name	Latitude	Longitude	Location for DC Location	Location of CCC/ICCC Location
32.	Balson	25°27'22.88"N	81°51'32.00"E	KM CCC	KM CCC
33.	Hasim road railway crossing	25°27'39.61"N	81°52'2.12"E	KM CCC	KM CCC
34.	Prayag ghat railway station ke exit gate	Exact Location would be finalized post selection of bidder	Exact Location would be finalized post selection of bidder	KM CCC	KM CCC
35.	Jhunsi se sangam aane wale pipa pul poorvi-1&2	Exact Location would be finalized post selection of bidder	Exact Location would be finalized post selection of bidder	KM CCC	KM CCC
36.	Old G.T.- NH2 Mod(Rahimapur)	Exact Location would be finalized post selection of bidder	Exact Location would be finalized post selection of bidder	KM CCC	KM CCC

**14.3. Locations for Video Analytics based Crowd Management for Kumbh Mela 2019**

<b>S. No.</b>	<b>Location Name</b>	<b>Fixed Box Cameras for Head Count Video Analytics</b>	<b>Location for DC Location</b>	<b>Location of CCC/ICCC Location</b>
1.	Sangam nose	6	KM CCC	KM CCC
2.	Arail ghat	4	KM CCC	KM CCC
3.	Chhatnag ghat	2	KM CCC	KM CCC
4.	Ganguli shivala ghat	2	KM CCC	KM CCC
5.	Dashashwamedh ghat	2	KM CCC	KM CCC
6.	Ganga Prasar ghat east	3	KM CCC	KM CCC
7.	Ganga Prasar ghat east & west (Kali sadak & sangam nose ke bich)	4	KM CCC	KM CCC
8.	Gangeshwar Mahadeo ke pas keg hat	4	KM CCC	KM CCC



**14.4. Locations of City Surveillance System for Permanent Infrastructure for Phase 1**

S. No.	Area/Loc ation Type	Location Name	Latitude	Longitude	PTZ	ANPR	Fixed Box Cameras	Location for DC Location	Location of CCC/ICCC Location
1	City Area	OP Bamhrauli	25°27'1.97"N	81°43'30.37"E	1	0	2	AMC Campus	MCR CCC
2		T.P. Nagar Tiraha	25°26'58.98"N	81°46'16.06"E	1	0	3	AMC Campus	MCR CCC
3		PS Dhoomanganj Chauraha	25°26'56.53"N	81°46'44.55"E	1	0	4	AMC Campus	MCR CCC
4		Pritam nagar tiraha	25°26'55.09"N	81°46'51.81"E	0	0	2	AMC Campus	MCR CCC
5		Kandhai pur mod	25°26'57.18"N	81°46'39.87"E	0	0	1	AMC Campus	MCR CCC
6		Sherwani Mod Tiraha	25°26'49.18"N	81°47'23.41"E	1	0	3	AMC Campus	MCR CCC
7		Mahila Gram Tiraha	25°26'39.24"N	81°47'50.11"E	1	2	3	AMC Campus	MCR CCC
8		Pani ki Tanki Chauraha (N.Y. Road)	25°26'58.26"N	81°49'1.02"E	1	0	4	AMC Campus	MCR CCC
9		Dhobhi Ghat Chouraha	25°27'34.70"N	81°50'14.22"E	1	0	4	AMC Campus	MCR CCC
10		Lok Sewa Aayog Chouraha	25°27'32.92"N	81°50'30.75"E	1	0	4	AMC Campus	MCR CCC

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S. No.	Area/Location Type	Location Name	Latitude	Longitude	PTZ	ANPR	Fixed Box Cameras	Location for DC Location	Location of CCC/ICCC Location
11		Hindu Hostel Chouraha	25°27'29.15"N	81°50'54.55"E	1	0	4	AMC Campus	MCR CCC
12		Balson Chouraha/Bhardwaj Park Chouraha/Louder Chauraha	25°27'22.88"N	81°51'32.00"E	1	0	4	AMC Campus	MCR CCC
13		Parvati Nursing Home Chouraha	25°27'16.38"N	81°51'38.39"E	0	0	2	AMC Campus	MCR CCC
14		Sangam Petrol Pump/Sohabatia Bag Dot Pul	25°26'53.05"N	81°51'48.49"E	1	0	3	AMC Campus	MCR CCC
15		Geeta Niketan Tiraha	25°26'41.51"N	81°51'57.50"E	1	0	3	AMC Campus	MCR CCC
16		GT Jawahar Chouraha	25°26'32.04"N	81°52'4.19"E	1	0	4	AMC Campus	MCR CCC
17		Alopi Devi Mandir Tiraha	25°26'39.72"N	81°52'14.73"E	1	0	3	AMC Campus	MCR CCC
18		Shastri Bridge (East, West & Middle)	25°26'11.39"N	81°53'21.16"E	3	0	0	AMC Campus	MCR CCC
19		Chattnaag Mod Tiraha	25°25'36.27"N	81°55'15.08"E	1	0	3	AMC Campus	MCR CCC
20		Triveni Puram Chouraha	25°25'35.96"N	81°55'26.69"E	1	2	3	AMC Campus	MCR CCC

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S. No.	Area/Location Type	Location Name	Latitude	Longitude	PTZ	ANPR	Fixed Box Cameras	Location for DC Location	Location of CCC/ICCC Location
21		Andawa Chauraha	25°25'40.20"N	81°56'5.85"E	1	8	3	AMC Campus	MCR CCC
22		Sehson Chouraha	25°29'2.19"N	81°58'44.31"E	1	4	4	AMC Campus	MCR CCC
23		Leprosy Chouraha	25°24'51.72"N	81°51'25.90"E	2	8	5	AMC Campus	MCR CCC
24		Old Naini Bridge East	25°25'13.25"N	81°51'5.23"E	1	0	3	AMC Campus	MCR CCC
25		Old Yumna Bridge West Side	25°25'40.98"N	81°50'56.03"E	1	0	3	AMC Campus	MCR CCC
26		Gaughat Tiraha	25°25'45.07"N	81°50'51.66"E	1	0	3	AMC Campus	MCR CCC
27		Arya Kanya Chouraha	25°25'59.08"N	81°50'46.39"E	1	0	4	AMC Campus	MCR CCC
28		KothaParcha Dot Pul	25°26'9.31"N	81°50'46.43"E	1	0	5	AMC Campus	MCR CCC
29		Rambagh Bus Stand Chouraha	25°26'15.23"N	81°50'47.76"E	1	0	4	AMC Campus	MCR CCC
30		Ram Bagh Sundaram Tower Chouraha	25°26'22.84"N	81°50'49.56"E	1	0	4	AMC Campus	MCR CCC
31		Medical Chouraha	25°26'49.08"N	81°51'5.11"E	1	0	4	AMC Campus	MCR CCC

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S. No.	Area/Location Type	Location Name	Latitude	Longitude	PTZ	ANPR	Fixed Box Cameras	Location for DC Location	Location of CCC/ICCC Location
32		Saraswati Heartcare Chouraha	25°27'6.57"N	81°51'18.39"E	1	0	4	AMC Campus	MCR CCC
33		New Yamuna Bridge Both Sides	25°25'40.28"N	81°51'40.39"E	1	0	4	AMC Campus	MCR CCC
34		Minto park tiraha	25°25'49.97"N	81°51'39.63"E	1	2	3	AMC Campus	MCR CCC
35		Bangad Dharamshala Chouraha	25°26'24.74"N	81°51'47.18"E	1	0	4	AMC Campus	MCR CCC
36		Harshvardhan Chouraha	25°26'2.78"N	81°51'39.38"E	1	4	4	AMC Campus	MCR CCC
37		Bairhana Chouraha	25°26'22.94"N	81°51'38.85"E	1	0	4	AMC Campus	MCR CCC
38		Madhavapur Dehati Rasgulla Tiraha	25°26'37.14"N	81°51'38.05"E	1	0	3	AMC Campus	MCR CCC
39		CMP Dot Pul West Side	25°26'40.13"N	81°51'34.52"E	0	0	2	AMC Campus	MCR CCC
40		PS George town Chauraha, Malviya Road	25°26'57.22"N	81°51'38.55"E	1	0	4	AMC Campus	MCR CCC
41		SRN Tiraha	25°26'52.26"N	81°50'55.00"E	1	0	2	AMC Campus	MCR CCC
42		Civil Lines Hanuman Mandir	25°26'58.27"N	81°50'30.13"E	1	0	4	AMC Campus	MCR CCC

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S. No.	Area/Location Type	Location Name	Latitude	Longitude	PTZ	ANPR	Fixed Box Cameras	Location for DC Location	Location of CCC/ICCC Location
43		Income tax Chouraha/Civil Lines Bus Stand Chauraha	25°26'58.75"N	81°50'25.57"E	0	0	3	AMC Campus	MCR CCC
44		Civil Line Bus Station Main Entry Gate/Hindu Mahila Inter College	25°26'59.27"N	81°50'21.06"E	2	0	4	AMC Campus	MCR CCC
45		Subhash Chouraha	25°27'1.01"N	81°50'4.40"E	1	0	4	AMC Campus	MCR CCC
46		Harsh Hotel Chouraha	25°27'3.43"N	81°49'43.27"E	1	0	4	AMC Campus	MCR CCC
47		Pathar Girijaghar Chouraha	25°27'4.27"N	81°49'35.84"E	0	0	3	AMC Campus	MCR CCC
48		Balmiki Tiraha	25°26'56.66"N	81°49'17.87"E	1	0	4	AMC Campus	MCR CCC
49		Thana civil lines/Nagar Nigam Chauraha	25°26'54.78"N	81°49'34.27"E	1	0	3	AMC Campus	MCR CCC
50		Railway Station Junction Civil Side Chouraha	25°26'38.82"N	81°49'31.21"E	1	0	4	AMC Campus	MCR CCC
51		DRM office k saamne	25°26'51.58"N	81°50'2.97"E	1	0	3	AMC Campus	MCR CCC
52		Roadways Bus Stand Civil Lines	25°26'50.60"N	81°50'17.56"E	2	0	4	AMC Campus	MCR CCC

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S. No.	Area/Location Type	Location Name	Latitude	Longitude	PTZ	ANPR	Fixed Box Cameras	Location for DC Location	Location of CCC/ICCC Location
53		Fire Brigade Chouraha	25°26'49.81"N	81°50'24.09"E	1	0	5	AMC Campus	MCR CCC
54		Bai ka Bag Tiraha	25°26'14.72"N	81°51'7.44"E	1	0	3	AMC Campus	MCR CCC
55		South Malaka Sabjimandi Tiraha	25°26'23.17"N	81°50'37.93"E	1	0	3	AMC Campus	MCR CCC
56		Jhonson Ganj Chouraha	25°26'33.98"N	81°50'10.57"E	1	0	4	AMC Campus	MCR CCC
57		Railway Station Junction City Side Chouraha/Saalik Ram Chauraha	25°26'38.82"N	81°49'31.21"E	1	0	4	AMC Campus	MCR CCC
58		Jogibir Tiraha	25°26'42.09"N	81°49'6.41"E	1	0	3	AMC Campus	MCR CCC
59		Mayo Hall Chouraha/Rana Pratab Chouraha	25°27'39.44"N	81°50'31.35"E	1	0	4	AMC Campus	MCR CCC
60		Traffic Police Lines Chauraha	25°28'0.11"N	81°50'36.95"E	1	0	4	AMC Campus	MCR CCC
61		Lajpat Road Tiraha	25°28'27.87"N	81°50'53.24"E	0	0	2	AMC Campus	MCR CCC
62		MNIT Tiraha	25°29'39.69"N	81°51'40.72"E	1	0	3	AMC Campus	MCR CCC

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S. No.	Area/Location Type	Location Name	Latitude	Longitude	PTZ	ANPR	Fixed Box Cameras	Location for DC Location	Location of CCC/ICCC Location
63		Teliyar Ganj Chauraha	25°29'54.90"N	81°51'47.13"E	1	0	3	AMC Campus	MCR CCC
64		Phaphamau Bridge Both ends	25°30'26.50"N	81°51'57.42"E	2	0	4	AMC Campus	MCR CCC
65		Phaphamau Ganga Ghat Tiraha/Near Phaphamau Bridge	25°30'26.50"N	81°51'57.42"E	1	0	2	AMC Campus	MCR CCC
66		Phaphamau Tiraha	25°31'19.05"N	81°51'59.83"E	1	0	3	AMC Campus	MCR CCC
67		Fafamau Bazar Tiraha	25°31'19.05"N	81°51'59.83"E	1	4	3	AMC Campus	MCR CCC
68		Fafamau Pani ki Tanki Tiraha	25°31'30.93"N	81°51'37.56"E	0	0	2	AMC Campus	MCR CCC
69		Fafamau Purani Chungi	25°31'33.16"N	81°51'31.32"E	1	0	2	AMC Campus	MCR CCC
70		Shantipuram Chouraha	25°31'35.42"N	81°51'23.26"E	1	0	3	AMC Campus	MCR CCC
71		UPTRON Chauraha	25°29'44.38"N	81°52'11.56"E	1	2	4	AMC Campus	MCR CCC
72		Govind pur Chauraha	25°29'35.34"N	81°52'19.25"E	1	0	4	AMC Campus	MCR CCC
73		Mazar Chauraha/NCC Ground	25°28'46.48"N	81°51'44.66"E	1	0	4	AMC Campus	MCR CCC

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S. No.	Area/Location Type	Location Name	Latitude	Longitude	PTZ	ANPR	Fixed Box Cameras	Location for DC Location	Location of CCC/ICCC Location
74		Bank Road Chauraha	25°28'11.92"N	81°51'44.82"E	1	0	4	AMC Campus	MCR CCC
75		Lalla Chungi Chauraha	25°28'3.75"N	81°51'48.65"E	1	0	4	AMC Campus	MCR CCC
76		Anand Bhawan Chauraha	25°27'34.89"N	81°51'36.28"E	1	0	4	AMC Campus	MCR CCC
77		Mandal Ayukt chauraha	25°28'25.56"N	81°51'27.55"E	1	0	4	AMC Campus	MCR CCC
78		Hashimpur Railway Crossing	25°27'39.61"N	81°52'2.12"E	0	0	3	AMC Campus	MCR CCC
79		Hashimpur Chauraha	25°27'37.97"N	81°51'57.12"E	1	0	4	AMC Campus	MCR CCC
80		Police Lines Main Gate Tiraha	25°28'6.26"N	81°51'5.56"E	1	0	3	AMC Campus	MCR CCC
81		SSP Office Gate	25°28'7.09"N	81°51'7.78"E	0	0	2	AMC Campus	MCR CCC
82		Niranjan dot pul Both Ends	25°26'40.14"N	81°50'16.97"E	0	0	5	AMC Campus	MCR CCC
83		Cut before railway line	25°26'44.10"N	81°50'19.10"E	1	0	3	AMC Campus	MCR CCC
84		Elgian chauraha next to polo ground	25°27'15.62"N	81°49'20.53"E	1	0	4	AMC Campus	MCR CCC



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S. No.	Area/Location Type	Location Name	Latitude	Longitude	PTZ	ANPR	Fixed Box Cameras	Location for DC Location	Location of CCC/ICCC Location
85		high court gate no. 2	25°27'16.56"N	81°49'12.69"E	1	0	3	AMC Campus	MCR CCC
86		Chief Justice Residence	25°27'17.28"N	81°49'5.68"E	0	0	2	AMC Campus	MCR CCC
87		Mewalal ki Bagiya Chouraha	25°23'25.81"N	81°51'47.68"E	1	0	3	AMC Campus	MCR CCC
88		Sargam Talkies Chouraha	25°22'53.48"N	81°52'12.53"E	1	0	3	AMC Campus	MCR CCC
89		ADA Mod Tiraha	25°22'47.31"N	81°52'15.89"E	1	0	3	AMC Campus	MCR CCC
90		Kundan Guest House	25°27'30.95"N	81°51'58.02"E	1	0	4	AMC Campus	MCR CCC
91		OP Allapur Chauraha	25°27'26.22"N	81°51'46.06"E	1	0	4	AMC Campus	MCR CCC
92		Baghambri Tiraha	25°27'21.19"N	81°52'29.37"E	1	0	3	AMC Campus	MCR CCC
93		Near Baghambri Gaddi	25°27'11.24"N	81°52'30.43"E	0	0	2	AMC Campus	MCR CCC
94		Chandramauli Guest House Tiraha	25°26'54.27"N	81°52'33.15"E	1	0	3	AMC Campus	MCR CCC
95		Labour Tiraha	25°27'18.17"N	81°52'17.25"E	1	0	3	AMC Campus	MCR CCC

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S. No.	Area/Location Type	Location Name	Latitude	Longitude	PTZ	ANPR	Fixed Box Cameras	Location for DC Location	Location of CCC/ICCC Location
96		Pani ki Tanki-Bagambri Road	25°27'4.86"N	81°52'31.64"E	0	0	3	AMC Campus	MCR CCC
97		Pani ki Tanki-Matiyara Road	25°27'5.11"N	81°52'25.10"E	1	0	3	AMC Campus	MCR CCC
98		Thana Shahganj Tiraha/Nakkhas Kohana Tiraha	25°26'54.27"N	81°52'33.15"E	1	0	3	AMC Campus	MCR CCC
99		Thana Kotwali Tiraha	25°27'18.17"N	81°52'17.25"E	1	0	4	AMC Campus	MCR CCC
100		Loknaath Tiraha	25°27'4.86"N	81°52'31.64"E	0	0	4	AMC Campus	MCR CCC
101		Sulaki Chauraha	25°26'25.12"N	81°48'33.60"E	1	0	4	AMC Campus	MCR CCC
102		Ram Bhawan Chauraha	25°26'20.93"N	81°49'23.62"E	1	0	4	AMC Campus	MCR CCC
103		Zero Road Bus Stand Chouraha	25°26'11.23"N	81°50'28.93"E	1	0	2	AMC Campus	MCR CCC
104		Mansarovar Chouraha	25°26'10.56"N	81°50'37.65"E	1	0	4	AMC Campus	MCR CCC
105		Chandralog Talkies k paas	25°26'9.31"N	81°50'46.43"E	1	0	4	AMC Campus	MCR CCC
106		Baluha Ghat Chauraha	25°25'49.70"N	81°50'36.95"E	1	0	4	AMC Campus	MCR CCC

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S. No.	Area/Location Type	Location Name	Latitude	Longitude	PTZ	ANPR	Fixed Box Cameras	Location for DC Location	Location of CCC/ICCC Location
107	<b>Kumbh/Parade Area</b>	Kali Sadak Mod	25°26'24.63"N	81°52'9.30"E	1	0	4	KM CCC	KM CCC
108		Lal sadak mod	25°26'20.40"N	81°52'12.17"E	0	0	3	KM CCC	KM CCC
109		Fort Road Chauraha	25°26'10.46"N	81°52'18.80"E	1	0	4	KM CCC	KM CCC
110		Kali sadak Bhagambari crossing	25°26'25.50"N	81°52'35.16"E	0	0	4	KM CCC	KM CCC
111		Lal sadak prashasnik road chauraha	25°26'18.43"N	81°52'43.48"E	0	0	4	KM CCC	KM CCC
112		Kali ramp	25°26'17.24"N	81°52'50.90"E	1	0	4	KM CCC	KM CCC
113		Triveni ramp	25°26'11.02"N	81°52'47.05"E	1	0	4	KM CCC	KM CCC
114		Triveni road Jagdish road tiraha	25°26'11.04"N	81°52'40.58"E	1	0	3	KM CCC	KM CCC
115		Jagdish ramp	25°26'4.95"N	81°52'45.06"E	1	0	3	KM CCC	KM CCC
116		Bhagambari road (pakad ped) Triveni road crossing	25°26'11.08"N	81°52'34.55"E	0	0	3	KM CCC	KM CCC
117		Baghambari Road Tiraha (Alopi Bagh Road)	25°27'21.19"N	81°52'29.37"E	1	0	0	KM CCC	KM CCC

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S. No.	Area/Location Type	Location Name	Latitude	Longitude	PTZ	ANPR	Fixed Box Cameras	Location for DC Location	Location of CCC/ICCC Location
118		Nehru Boat club	25°25'45.58"N	81°51'24.26"E	1	0	0	KM CCC	KM CCC
119		Control room nigrani hetu	25°26'13.07"N	81°52'47.00"E	0	0	2	KM CCC	KM CCC
120	<b>Kumbh/Sangam Area</b>	Mahaveer ji	25°26'3.20"N	81°52'46.52"E	1	0	3	KM CCC	KM CCC
121		Mahaveer ji holdup	25°26'0.01"N	81°52'47.73"E	2	0	0	KM CCC	KM CCC
122		Daraganj sabji mandi tiraha	25°26'34.10"N	81°52'54.41"E	1	0	3	KM CCC	KM CCC
123	<b>Railway Station</b>	MalGodam Gate	25°26'35.19"N	81°50'4.11"E	0	0	1	AMC Campus	MCR CCC
124		Allahabad Railway Junction, Gate No.1	25°26'38.20"N	81°49'40.95"E	0	0	2	AMC Campus	MCR CCC
125		Allahabad Railway Junction, Gate No.2	25°26'38.67"N	81°49'37.39"E	0	0	2	AMC Campus	MCR CCC
126		Allahabad Railway Junction, Gate No.3	25°26'38.93"N	81°49'34.39"E	0	0	2	AMC Campus	MCR CCC
127		Allahabad Railway Junction, Gate No.4	25°26'39.07"N	81°49'32.17"E	0	0	2	AMC Campus	MCR CCC
128		Allahabad Railway Junction, Gate No.5	25°26'39.70"N	81°49'27.94"E	0	0	2	AMC Campus	MCR CCC

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S. No.	Area/Location Type	Location Name	Latitude	Longitude	PTZ	ANPR	Fixed Box Cameras	Location for DC Location	Location of CCC/ICCC Location
129		Allahabad Railway Junction, Gate No.6	25°26'41.18"N	81°49'23.98"E	0	0	2	AMC Campus	MCR CCC
130		Prayag Railway Station entry 1	25°28'6.13"N	81°51'48.85"E	0	0	1	AMC Campus	MCR CCC
131		Prayag Railway Station entry 2	25°28'7.73"N	81°51'53.95"E	0	0	1	AMC Campus	MCR CCC
132		Prayag Railway Station entry 3	25°28'9.59"N	81°51'57.02"E	0	0	1	AMC Campus	MCR CCC
133		Prayag Station Mod	25°28'7.14"N	81°52'6.78"E	0	0	1	AMC Campus	MCR CCC
134		Jayaram road Ram priya road crossing	25°27'53.03"N	81°52'2.78"E	0	0	4	AMC Campus	MCR CCC
135		Daraganj Railway Station Entry Point	25°26'37.18"N	81°52'48.43"E	1	0	3	AMC Campus	MCR CCC
136		Prayag Ghat Railway Station	25°28'7.14"N	81°52'6.78"E	1	0	3	AMC Campus	MCR CCC
137		Nirala Gali Kotwali Daraganj	25°26'39.48"N	81°52'58.12"E	0	0	2	AMC Campus	MCR CCC
138		Jhunsi Railway Station tiraha towards station	25°25'59.02"N	81°55'1.02"E	1	0	3	AMC Campus	MCR CCC
139		Rambagh Gate 1	25°26'18.49"N	81°50'59.46"E	1	0	2	AMC Campus	MCR CCC

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S. No.	Area/Location Type	Location Name	Latitude	Longitude	PTZ	ANPR	Fixed Box Cameras	Location for DC Location	Location of CCC/ICCC Location
140		Rambagh Gate 2	25°26'18.49"N	81°50'59.46"E	1	0	2	AMC Campus	MCR CCC
141	SWM	SWM Plant-Buswar	25°22'44.02"N	81°48'27.04"E	2	2	8	AMC Campus	MCR CCC

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**14.5. Locations of City Surveillance System for Permanent Infrastructure for Phase 2**

S. No.	Area Type	Location Name	Latitude	Longitude	PTZ	ANPR	Fixed Box Cameras	Location for DC Location	Location of CCC/ICCC Location
1	City Area	Supply Depot Tiraha	25°26'38.21"N	81°48'19.46"E	1	0	3	AMC Campus	AMC Campus
2	City Area	Kariaapa Dwaar	25°26'55.25"N	81°48'54.34"E	0	0	3	AMC Campus	AMC Campus
3	City Area	High Court Hanuman Mandir Chouraha	25°27'6.17"N	81°49'19.20"E	1	0	4	AMC Campus	AMC Campus
4	City Area	Government Press Chouraha/Eklavya Chouraha	25°27'15.84"N	81°49'37.04"E	1	0	4	AMC Campus	AMC Campus
5	City Area	Bajaj Auto Chouraha	25°27'19.86"N	81°49'45.44"E	1	0	4	AMC Campus	AMC Campus
6	City Area	Vivekanand Chouraha	25°27'31.54"N	81°50'8.65"E	1	0	4	AMC Campus	AMC Campus
7	City Area	Saint Merry School	25°27'31.44"N	81°50'44.42"E	0	0	2	AMC Campus	AMC Campus
8	City Area	Indian Press Chouraha	25°27'29.16"N	81°51'16.25"E	1	0	4	AMC Campus	AMC Campus
9	City Area	Shakti coaching center	25°27'25.49"N	81°51'25.22"E	0	0	2	AMC Campus	AMC Campus
10	City Area	LIC Colony Turning	25°26'55.93"N	81°51'49.10"E	0	0	3	AMC Campus	AMC Campus

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S. No.	Area Type	Location Name	Latitude	Longitude	PTZ	ANPR	Fixed Box Cameras	Location for DC Location	Location of CCC/ICCC Location
11	City Area	Mazar Tiraha SohabetiyaBagh	25°26'49.72"N	81°51'51.81"E	0	0	3	AMC Campus	AMC Campus
12	City Area	Abusa Mod	25°25'26.44"N	81°59'47.78"E	1	0	3	AMC Campus	AMC Campus
13	City Area	MG Pannalal Tiraha	25°26'53.39"N	81°50'51.61"E	0	0	2	AMC Campus	AMC Campus
14	City Area	CAV College Tiraha	25°26'56.26"N	81°50'40.58"E	1	0	3	AMC Campus	AMC Campus
15	City Area	Chameli Bai Dharamshala Tiraha	25°26'28.69"N	81°50'19.61"E	1	0	3	AMC Campus	AMC Campus
16	City Area	Mishra Bhawan Chouraha	25°27'17.53"N	81°50'28.44"E	1	0	4	AMC Campus	AMC Campus
17	City Area	Mission Stanley Tiraha	81°49'6.41"E	1°50'43.55"E	1	0	3	AMC Campus	AMC Campus
18	City Area	Beli Chouraha	5°28'25.44"N	1°50'51.90"E	1	0	3	AMC Campus	AMC Campus
19	City Area	Maryodabad Chouraha	25°28'37.41"N	81°50'58.39"E	1	0	4	AMC Campus	AMC Campus
20	City Area	Rasoolabad Ghat Tiraha	5°29'29.00"N	1°51'17.53"E	1	0	3	AMC Campus	AMC Campus
21	City Area	Maharshi Patanjali School Chouraha	5°29'33.69"N	1°51'27.15"E	1	0	4	AMC Campus	AMC Campus



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S. No.	Area Type	Location Name	Latitude	Longitude	PTZ	ANPR	Fixed Box Cameras	Location for DC Location	Location of CCC/ICCC Location
22	City Area	University Chowki Tiraha	25°27'52.81"N	81°51'26.02"E	0	0	3	AMC Campus	AMC Campus
23	City Area	University Chouraha	25°27'48.79"N	81°51'36.41"E	1	0	4	AMC Campus	AMC Campus
24	City Area	Anand Bhawan Colonelganj tiraha	5°27'40.09"N	1°51'28.99"E	1	0	3	AMC Campus	AMC Campus
25	City Area	Swaraj Bhawan Colenganj Mod	25°27'36.88"N	1°51'34.24"E	0	0	3	AMC Campus	AMC Campus
26	City Area	Colonelganj Thana Chauraha	25°27'40.11"N	81°51'27.60"E	1	0	4	AMC Campus	AMC Campus
27	City Area	A N Jha Hostel	5°27'41.33"N	1°51'18.27"E	0	0	2	AMC Campus	AMC Campus
28	City Area	Manmohan Park	25°27'43.86"N	81°51'1.38"E	1	0	5	AMC Campus	AMC Campus
29	City Area	Katra Chauraha/Netram Chauraha	25°27'52.41"N	81°51'7.72"E	1	0	4	AMC Campus	AMC Campus
30	City Area	Laxmi Talkies Chouraha	25°28'5.84"N	81°51'16.74"E	1	0	4	AMC Campus	AMC Campus
31	City Area	Carpentry chauraha	25°28'16.75"N	1°51'23.52"E	1	0	4	AMC Campus	AMC Campus
32	City Area	Scout and guides tiraha	25°28'35.99"N	1°51'36.20"E	1	0	3	AMC Campus	AMC Campus

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S. No.	Area Type	Location Name	Latitude	Longitude	PTZ	ANPR	Fixed Box Cameras	Location for DC Location	Location of CCC/ICCC Location
33	City Area	Fawwara chauraha	25°28'33.92"N	81°51'13.90"E	1	0	3	AMC Campus	AMC Campus
34	City Area	Aabari chauraha	25°28'34.83"N	81°51'9.87"E	0	0	3	AMC Campus	AMC Campus
35	City Area	Tripathi Chauraha	25°28'27.50"N	1°51'12.46"E	0	0	2	AMC Campus	AMC Campus
36	City Area	Anand Hospital Chouraha	25°27'49.73"N	81°50'54.08"E	1	0	4	AMC Campus	AMC Campus
37	City Area	Collectorate Chauraha	25°28'1.29"N	81°51'0.61"E	1	0	4	AMC Campus	AMC Campus
38	City Area	Police Office Tiraha	25°28'6.26"N	81°51'5.56"E	1	0	3	AMC Campus	AMC Campus
39	City Area	Jagram Chouraha	25°28'15.04"N	81°51'8.45"E	1	0	4	AMC Campus	AMC Campus
40	City Area	BHS School	25°27'39.22"N	81°50'26.40"E	0	0	2	AMC Campus	AMC Campus
41	City Area	Marry Lucos School	25°27'31.44"N	81°50'44.42"E	0	0	2	AMC Campus	AMC Campus
42	City Area	Marry Vanamekar Girls Inter College	25°28'4.91"N	81°50'49.39"E	0	0	2	AMC Campus	AMC Campus
43	City Area	Bal Bharti School	25°27'11.56"N	81°50'40.12"E	0	0	2	AMC Campus	AMC Campus

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S. No.	Area Type	Location Name	Latitude	Longitude	PTZ	ANPR	Fixed Box Cameras	Location for DC Location	Location of CCC/ICCC Location
44	City Area	Girls high school	25°27'11.05"N	1°49'48.14"E	0	0	2	AMC Campus	AMC Campus
45	City Area	High Court club	25°27'17.02"N	81°49'7.70"E	1	0	3	AMC Campus	AMC Campus
46	City Area	Main Post Office Chouraha	25°27'13.86"N	81°49'36.82"E	0	0	3	AMC Campus	AMC Campus
47	City Area	Patrika Chouraha	25°27'18.43"N	81°50'21.10"E	1	0	4	AMC Campus	AMC Campus
48	City Area	Mahadevi Verma Tiraha/Career Coachin Center	25°27'7.26"N	81°50'36.84"E	1	0	3	AMC Campus	AMC Campus
49	City Area	Chandra Shekhar Park Gate 1	25°27'15.57"N	1°50'43.38"E	1	0	3	AMC Campus	AMC Campus
50	City Area	Chandra Shekhar Park Gate 2	25°27'24.81"N	1°50'51.27"E	0	0	2	AMC Campus	AMC Campus
51	City Area	Chandra Shekhar Park Gate 3	25°27'29.74"N	81°51'7.02"E	0	0	2	AMC Campus	AMC Campus
52	City Area	Chandra Shekhar Park Gate 5	25°27'15.99"N	81°51'1.88"E	1	0	3	AMC Campus	AMC Campus
53	City Area	Chandra Shekhar Park Gate 6	25°27'8.90"N	81°50'59.10"E	1	0	3	AMC Campus	AMC Campus
54	City Area	Rajapur tiraha	25°27'58.38"N	81°50'20.60"E	1	0	3	AMC Campus	AMC Campus

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S. No.	Area Type	Location Name	Latitude	Longitude	PTZ	ANPR	Fixed Box Cameras	Location for DC Location	Location of CCC/ICCC Location
55	City Area	Vandana Women's hospital/Strechi Chouraha	25°27'36.12"N	81°50'2.03"E	1	0	4	AMC Campus	AMC Campus
56	City Area	Sai Mandir chauraha	25°27'39.24"N	81°49'32.54"E	0	0	2	AMC Campus	AMC Campus
57	City Area	Sadar Bazar Chouraha	25°28'3.21"N	81°49'12.11"E	1	0	4	AMC Campus	AMC Campus
58	City Area	Indira Murthi Chouraha	25°27'40.06"N	81°49'24.03"E	1	0	4	AMC Campus	AMC Campus
59	City Area	Bahgunna Market Tiraha	25°27'43.56"N	81°49'24.33"E	0	0	2	AMC Campus	AMC Campus
60	City Area	PHQ Chauraha	25°27'38.29"N	81°49'40.20"E	1	0	4	AMC Campus	AMC Campus
61	City Area	Circuit house entry	25°27'54.04"N	81°49'25.51"E	1	0	3	AMC Campus	AMC Campus
62	City Area	Ashok Nagar Chouraha/Baba Chauraha	25°27'38.97"N	81°49'51.10"E	1	0	4	AMC Campus	AMC Campus
63	City Area	St Merry Junior college	25°27'38.97"N	81°49'51.10"E	0	0	2	AMC Campus	AMC Campus
64	City Area	DIG range chauraha/Clive Chauraha	25°27'36.77"N	81°49'55.06"E	1	0	4	AMC Campus	AMC Campus

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S. No.	Area Type	Location Name	Latitude	Longitude	PTZ	ANPR	Fixed Box Cameras	Location for DC Location	Location of CCC/ICCC Location
65	City Area	Hira Halwai chauraha	25°27'35.38"N	81°50'9.10"E	0	0	2	AMC Campus	AMC Campus
66	City Area	Karbala Chouraha	25°27'21.19"N	81°52'29.37"E	1	0	4	AMC Campus	AMC Campus
67	City Area	Khuldabad Sabji Mandi Chouraha/Murkari Chauraha	25°26'20.93"N	81°49'23.62"E	1	0	4	AMC Campus	AMC Campus
68	City Area	Batasha Tiraha	25°27'5.11"N	81°52'25.10"E	1	0	3	AMC Campus	AMC Campus
69	City Area	Chowk Ghantaghar Chouraha	25°26'14.21"N	81°50'3.17"E	1	0	3	AMC Campus	AMC Campus
70	City Area	Ajanta/Agrasen Chouraha	25°26'12.99"N	81°50'17.03"E	1	0	4	AMC Campus	AMC Campus
71	City Area	Hot Stuff Chouraha	25°26'14.72"N	81°51'7.44"E	1	0	4	AMC Campus	AMC Campus
72	City Area	PVR	25°26'22.94"N	81°51'38.85"E	1	0	2	AMC Campus	AMC Campus
73	City Area	Yatrik Hotel Chouraha	25°26'24.74"N	81°51'47.18"E	1	0	4	AMC Campus	AMC Campus
74	City Area	Jhalwa Chouraha	25°26'7.81"N	81°46'23.70"E	1	6	3	AMC Campus	AMC Campus

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S. No.	Area Type	Location Name	Latitude	Longitude	PTZ	ANPR	Fixed Box Cameras	Location for DC Location	Location of CCC/ICCC Location
75	City Area	OP Rajrooppur Tiraha	25°26'13.79"N	81°47'19.87"E	1	0	3	AMC Campus	AMC Campus
76	City Area	Kasari Masari	25°25'56.50"N	81°47'58.22"E	1	0	4	AMC Campus	AMC Campus
77	City Area	PeepalGaon	25°25'27.46"N	81°46'15.88"E	1	0	4	AMC Campus	AMC Campus
78	City Area	IIIT Chauraha	25°25'49.77"N	81°46'2.37"E	1	0	4	AMC Campus	AMC Campus
79	City Area	Rahimabad	25°26'8.96"N	81°45'11.18"E	1	0	3	AMC Campus	AMC Campus
80	City Area	Shaukat Ali Tiraha Narula Road	25°25'55.78"N	81°49'20.72"E	1	0	3	AMC Campus	AMC Campus
81	City Area	Mutthiganj Chauraha	25°25'50.33"N	81°50'28.58"E	1	0	4	AMC Campus	AMC Campus
82	City Area	Gol Park Chouraha, Old Allahabad	25°25'50.12"N	81°49'42.98"E	0	0	4	AMC Campus	AMC Campus
83	City Area	Tagore town	25°27'18.96"N	81°51'44.91"E	0	0	4	AMC Campus	AMC Campus
84	City Area	OP Bamhrauli	25°27'1.97"N	81°43'30.37"E	0	4	0	AMC Campus	AMC Campus
85	City Area	Bairhana Chouraha	25°26'22.94"N	81°51'38.85"E	0	8	0	AMC Campus	AMC Campus

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S. No.	Area Type	Location Name	Latitude	Longitude	PTZ	ANPR	Fixed Box Cameras	Location for DC Location	Location of CCC/ICCC Location
86	City Area	Shantipuram Chouraha	25°31'35.42"N	81°51'23.26"E	0	4	0	AMC Campus	AMC Campus
87	City Area	Govind pur Chauraha	25°29'35.34"N	81°52'19.25"E	0	4	0	AMC Campus	AMC Campus

**14.6. Locations of Traffic Signals/Traffic Blinkers**

S. No.	Location Name	Latitude	Longitude	Traffic Signal/Traffic Blinker	Location for DC Location	Location of CCC/ICCC Location
1.	PS Dhoomanganj Chauraha	25°26'56.53"N	81°46'44.55"E	Traffic Signal	AMC Campus	AMC Campus
2.	High Court Hanuman Mandir Chouraha	25°27'6.17"N	81°49'19.20"E	Traffic Blinker	AMC Campus	AMC Campus
3.	Allahabad Bank Chouraha	25°27'13.92"N	81°49'33.32"E	Traffic Blinker	AMC Campus	AMC Campus
4.	Government Press Chouraha/Eklavya Chouraha	25°27'15.84"N	81°49'37.04"E	Traffic Signal	AMC Campus	AMC Campus
5.	Vivekanand Chouraha	25°27'31.54"N	81°50'8.65"E	Traffic Blinker	AMC Campus	AMC Campus
6.	Dhobhi Ghat Chouraha	25°27'34.70"N	81°50'14.22"E	Traffic Signal	AMC Campus	AMC Campus
7.	Lok Sewa Aayog Chouraha	25°27'32.92"N	81°50'30.75"E	Traffic Signal	AMC Campus	AMC Campus
8.	Indian Press Chouraha	25°27'29.16"N	81°51'16.25"E	Traffic Blinker	AMC Campus	AMC Campus
9.	Balson Chouraha/Bhardwaj Park Chouraha/Louder Chauraha	25°27'22.88"N	81°51'32.00"E	Traffic Signal	AMC Campus	AMC Campus
10.	Parvati Nursing Home Chouraha	25°27'16.38"N	81°51'38.39"E	Traffic Blinker	AMC Campus	AMC Campus
11.	GT Jawahar Chouraha	25°26'32.04"N	81°52'4.19"E	Traffic Signal	AMC Campus	AMC Campus



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S. No.	Location Name	Latitude	Longitude	Traffic Signal/Traffic Blinker	Location for DC Location	Location of CCC/ICCC Location
12.	Jhansi Station Chauraha	25°25'59.02"N	81°55'1.02"E	Traffic Signal	AMC Campus	AMC Campus
13.	Triveni Puram Chouraha	25°25'35.96"N	81°55'26.69"E	Traffic Signal	AMC Campus	AMC Campus
14.	Katka Tiraha	25°25'43.16"N	81°55'54.00"E	Traffic Blinker	AMC Campus	AMC Campus
15.	Sherdih Tiraha	25°26'44.22"N	81°56'57.98"E	Traffic Signal	AMC Campus	AMC Campus
16.	Andawa Chauraha	25°25'40.20"N	81°56'5.85"E	Traffic Signal	AMC Campus	AMC Campus
17.	Sehson Chouraha	25°29'2.19"N	81°58'44.31"E	Traffic Signal	AMC Campus	AMC Campus
18.	Leprosy Chouraha	25°24'51.72"N	81°51'25.90"E	Traffic Signal	AMC Campus	AMC Campus
19.	Arya Kanya Chouraha	25°25'59.08"N	81°50'46.39"E	Traffic Signal	AMC Campus	AMC Campus
20.	Rambagh Bus Stand Chouraha	25°26'15.23"N	81°50'47.76"E	Traffic Signal	AMC Campus	AMC Campus
21.	Medical Chouraha	25°26'49.08"N	81°51'5.11"E	Traffic Signal	AMC Campus	AMC Campus
22.	Bangad Dharamshala Chouraha	25°26'24.74"N	81°51'47.18"E	Traffic Signal	AMC Campus	AMC Campus

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S. No.	Location Name	Latitude	Longitude	Traffic Signal/Traffic Blinker	Location for DC Location	Location of CCC/ICCC Location
23.	Harshvardhan Chouraha	25°26'2.78"N	81°51'39.38"E	Traffic Signal	AMC Campus	AMC Campus
24.	Bairhana Chouraha	25°26'22.94"N	81°51'38.85"E	Traffic Signal	AMC Campus	AMC Campus
25.	Lohia Chauraha (Civil Lines Bus Stand)	25°26'58.75"N	81°50'25.57"E	Traffic Signal	AMC Campus	AMC Campus
26.	Balmiki Tiraha	25°26'56.66"N	81°49'17.87"E	Traffic Signal	AMC Campus	AMC Campus
27.	Fire Brigade Chouraha	25°26'49.81"N	81°50'24.09"E	Traffic Signal	AMC Campus	AMC Campus
28.	Jhonson Ganj Chouraha	25°26'33.98"N	81°50'10.57"E	Traffic Signal	AMC Campus	AMC Campus
29.	Railway Station Junction City Side Chouraha/Saalik Ram Chauraha	25°26'38.82"N	81°49'31.21"E	Traffic Signal	AMC Campus	AMC Campus
30.	Maha Rana Pratap Chouraha	25°27'39.44"N	81°50'31.35"E	Traffic Signal	AMC Campus	AMC Campus
31.	Traffic Police Lines Chauraha	25°28'0.11"N	81°50'36.95"E	Traffic Signal	AMC Campus	AMC Campus
32.	Teliyar Ganj Chauraha	25°29'54.90"N	81°51'47.13"E	Traffic Signal	AMC Campus	AMC Campus
33.	Fafamau Pani ki Tanki Tiraha	25°31'30.93"N	81°51'37.56"E	Traffic Blinker	AMC Campus	AMC Campus

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S. No.	Location Name	Latitude	Longitude	Traffic Signal/Traffic Blinker	Location for DC Location	Location of CCC/ICCC Location
34.	Shantipuram Chouraha	25°31'35.42"N	81°51'23.26"E	Traffic Signal	AMC Campus	AMC Campus
35.	Mazar Chauraha/NCC Ground	25°26'49.72"N	81°51'51.81"E	Traffic Signal	AMC Campus	AMC Campus
36.	University Chowki Tiraha	25°27'52.81"N	81°51'26.02"E	Traffic Blinker	AMC Campus	AMC Campus
37.	University Chouraha	25°27'48.79"N	81°51'36.41"E	Traffic Blinker	AMC Campus	AMC Campus
38.	Manmohan Park	25°27'43.86"N	81°51'1.38"E	Traffic Signal	AMC Campus	AMC Campus
39.	Laxmi Talkies	25°28'5.84"N	25°28'5.84"N	Traffic Signal	AMC Campus	AMC Campus
40.	Mandala Aayukt Karayalay Tiraha	25°28'25.56"N	81°51'27.55"E	Traffic Blinker	AMC Campus	AMC Campus
41.	Anand Hospital Chouraha	25°27'49.73"N	81°50'54.08"E	Traffic Signal	AMC Campus	AMC Campus
42.	Indira Murthi Chouraha	25°27'40.06"N	81°49'24.03"E	Traffic Signal	AMC Campus	AMC Campus
43.	Khuldabad Sabji Mandi Chouraha/Murkari Chauraha	25°26'20.93"N	81°49'23.62"E	Traffic Signal	AMC Campus	AMC Campus

**14.7. Locations for Command & Control Center (CCC) and Viewing Centers for Kumbh Mela 2019**

<b>S. No.</b>	<b>Location Name</b>
1.	Modern Control Room Command & Control Center (MCR CCC), Police Lines, Allahabad
2.	Kumbh Mela Command & Control Center (KM CCC) at Triveni Bandh
3.	Viewing Center Infrastructure at Sangam Nose
4.	Viewing Center Infrastructure at Arail Police Lines
5.	Viewing Center Infrastructure at North Jhunsi
6.	Viewing Center Infrastructure at South Jhunsi

**14.8. Locations for CCTV Surveillance for Kudda Addas, Secondary Collection Centers, Vulnerable Garbage Points**

S. No.	Location Name	Latitude	Longitude	Fixed Bullet IR Camera	Location for DC Location	Location of CCC/ICCC Location
1.	I M G Preetam Nagar(UCO Bank K pass)	25°27'2.74"N	81°46'46.59"E	1	AMC Campus	AMC Campus
2.	Preetam Nagar Chauraha	25°27'13.08"N	81°46'55.67"E	1	AMC Campus	AMC Campus
3.	GT Road Machli Mandi Chauraha	25°26'27.84"N	81°49'5.45"E	1	AMC Campus	AMC Campus
4.	Shikhar Hospital JhuleLal Nagar	25°26'28.62"N	81°48'59.82"E	1	AMC Campus	AMC Campus
5.	Shalimar Garden K Samne Karaili	25°25'48.75"N	81°48'22.51"E	1	AMC Campus	AMC Campus
6.	Khuldabad Safai ward office k bagal me lakadi mandi	25°26'18.76"N	81°49'20.48"E	1	AMC Campus	AMC Campus
7.	Dr. Katju road samera hotek k samne transformer k pehle	25°26'32.81"N	81°49'35.66"E	1	AMC Campus	AMC Campus
8.	Narula road khuladabad chauki transformer k paas	25°26'21.43"N	81°49'23.53"E	1	AMC Campus	AMC Campus
9.	GT road Dafreen hospitak gate k samne	25°26'18.91"N	81°49'37.33"E	1	AMC Campus	AMC Campus
10.	Gareeb nawaz madarsa gulab badi atala	25°26'15.85"N	81°49'29.73"E	1	AMC Campus	AMC Campus
11.	Tiny toys school k paas canara bank k samne	25°25'52.63"N	81°49'53.34"E	1	AMC Campus	AMC Campus

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S. No.	Location Name	Latitude	Longitude	Fixed Bullet IR Camera	Location for DC Location	Location of CCC/ICCC Location
12.	Atarsuiya chauraha k paas power house k samne Dr.chauhan eye clinic k samne	25°25'46.66"N	81°49'53.31"E	1	AMC Campus	AMC Campus
13.	Chaudhari garden gate.no-3 k paas	25°25'46.07"N	81°50'4.38"E	1	AMC Campus	AMC Campus
14.	Bhartiya bhawan pustakalaya k samne, SP office loknath, bhagwan das mishthan, zero road par	25°26'9.87"N	81°50'4.63"E	1	AMC Campus	AMC Campus
15.	Sheesh mahal naseem ply wale k paas handpump k bagal me, vairagi band ahiyapur Malyviya nagar, Mai lal paan wale k paas	25°26'3.58"N	81°50'30.29"E	1	AMC Campus	AMC Campus
16.	Tilak road imaam bada k paas, bakra mandi police chauki k paas,GT road bahadurganj majaar k samne	25°26'11.73"N	81°50'26.64"E	1	AMC Campus	AMC Campus
17.	Swroop rani hospital road,BSA k smane	25°26'44.67"N	81°50'50.01"E	1	AMC Campus	AMC Campus
18.	Chandpur ka hata	25°26'3.30"N	81°50'45.93"E	1	AMC Campus	AMC Campus
19.	Vijay bank hiwat road, indian girls school k smane, shankar parvati mandir badshahi mandi, ram mandir k samne, dariyashah road peepal k ped k paas,	25°26'35.79"N	81°50'14.44"E	1	AMC Campus	AMC Campus

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S. No.	Location Name	Latitude	Longitude	Fixed Bullet IR Camera	Location for DC Location	Location of CCC/ICCC Location
	rammurti adda k mohatsamanganj					
20.	Gaughat police booth k paas, laxminarayan road	25°25'42.99"N	81°50'36.32"E	1	AMC Campus	AMC Campus
21.	Divine heart school, naveda Ashok Nagar	25°28'12.98"N	81°49'36.01"E	1	AMC Campus	AMC Campus
22.	Y.M.C.A school sarojini naidu marg	25°27'44.67"N	81°49'41.25"E	1	AMC Campus	AMC Campus
23.	AG office kuda adda	25°27'22.69"N	81°49'40.33"E	1	AMC Campus	AMC Campus
24.	Chief Justice k awaas k bagal kapoor bangala	25°27'16.91"N	81°49'2.81"E	1	AMC Campus	AMC Campus
25.	Shagun guest house	25°28'16.17"N	81°51'5.13"E	1	AMC Campus	AMC Campus
26.	Doordarshan Chauraha	25°28'26.91"N	81°51'19.25"E	1	AMC Campus	AMC Campus
27.	Chuni Chokar Jagram Chauraha	25°28'19.69"N	81°51'11.18"E	1	AMC Campus	AMC Campus
28.	Jagdish bihar	25°28'25.27"N	81°51'1.63"E	1	AMC Campus	AMC Campus
29.	Lalla chungi chauraha	25°28'6.12"N	81°51'49.96"E	1	AMC Campus	AMC Campus

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S. No.	Location Name	Latitude	Longitude	Fixed Bullet IR Camera	Location for DC Location	Location of CCC/ICCC Location
30.	Science faculty jalansh mall shop k paas	25°27'44.07"N	81°51'12.54"E	1	AMC Campus	AMC Campus
31.	Shyam charan gupta sansad ji k awaas k paas	25°27'18.88"N	81°51'37.01"E	1	AMC Campus	AMC Campus
32.	Bhulai ka pura swaraj nagar lala ki saraiya wali mod k paas	25°28'59.22"N	81°52'2.06"E	1	AMC Campus	AMC Campus
33.	Kali mai mandir k samne	25°29'12.29"N	81°52'0.55"E	1	AMC Campus	AMC Campus
34.	Shiv chauraha k pass	25°28'35.69"N	81°52'33.06"E	1	AMC Campus	AMC Campus
35.	Sangam chauraha k paas	25°28'55.98"N	81°52'40.94"E	1	AMC Campus	AMC Campus
36.	Ladies park k samne naya bahrana	25°26'23.15"N	81°51'30.74"E	1	AMC Campus	AMC Campus
37.	Khinni k ped k paas old lashkar line	25°26'32.26"N	81°51'38.44"E	1	AMC Campus	AMC Campus
38.	transformer k paas malakraaj	25°26'27.33"N	81°51'1.76"E	1	AMC Campus	AMC Campus
39.	Kachi Sadak transformer k paas krishna nagar keedganj	25°26'13.63"N	81°51'23.61"E	1	AMC Campus	AMC Campus
40.	Vasarat k hata k samne bich wali sadak khalasi line keedganj	25°25'56.62"N	81°51'19.46"E	1	AMC Campus	AMC Campus



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S. No.	Location Name	Latitude	Longitude	Fixed Bullet IR Camera	Location for DC Location	Location of CCC/ICCC Location
41.	Adda k paas maruti dhal k paas	25°26'38.21"N	81°52'54.26"E	1	AMC Campus	AMC Campus
42.	Anamika chauraha k paas	25°26'36.97"N	81°52'55.51"E	1	AMC Campus	AMC Campus
43.	Singh lodge k paas tilak nagar	25°26'49.69"N	81°52'40.75"E	1	AMC Campus	AMC Campus
44.	Matiyara road khatikana basti neem k ped k paas	25°26'46.62"N	81°52'19.26"E	1	AMC Campus	AMC Campus
45.	Dandiya line kinara	25°27'26.10"N	81°52'1.25"E	1	AMC Campus	AMC Campus
46.	Ward office k samne	25°23'41.93"N	81°51'54.07"E	1	AMC Campus	AMC Campus
47.	Naini Bazaar shankar dhal	25°23'49.69"N	81°51'51.78"E	1	AMC Campus	AMC Campus
48.	Banarsi das sweet house k paas	25°23'40.76"N	81°51'42.05"E	1	AMC Campus	AMC Campus
49.	Daakkhane k samne	25°23'40.44"N	81°51'37.62"E	1	AMC Campus	AMC Campus
50.	Asha Hospital k paas	25°23'47.99"N	81°51'39.22"E	1	AMC Campus	AMC Campus
51.	Khuldabad Mandi	25°26'18.25"N	81°49'20.12"E	1	AMC Campus	AMC Campus

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S. No.	Location Name	Latitude	Longitude	Fixed Bullet IR Camera	Location for DC Location	Location of CCC/ICCC Location
52.	Budha Tajiya	25°26'14.60"N	81°49'21.67"E	1	AMC Campus	AMC Campus
53.	Machali Bazaar (Lukarhanj)	25°26'24.41"N	81°49'4.85"E	1	AMC Campus	AMC Campus
54.	Karaili Power House	25°25'52.17"N	81°48'58.99"E	1	AMC Campus	AMC Campus
55.	Labour Chauraha	25°25'53.71"N	81°49'2.75"E	1	AMC Campus	AMC Campus
56.	Gulabbadi	25°26'13.42"N	81°49'25.79"E	1	AMC Campus	AMC Campus
57.	Atala Tubewell	25°25'58.71"N	81°49'43.94"E	1	AMC Campus	AMC Campus
58.	Transport Nagar	25°27'12.40"N	81°46'12.22"E	1	AMC Campus	AMC Campus
59.	Kandhaipur Power House	25°27'5.09"N	81°46'39.05"E	1	AMC Campus	AMC Campus
60.	Preetam Nagar Jamun ka Ped	25°27'3.11"N	81°46'44.13"E	1	AMC Campus	AMC Campus
61.	Laal Bihara	25°26'52.61"N	81°46'42.92"E	1	AMC Campus	AMC Campus
62.	Bheem Ka Talab	25°27'4.04"N	81°45'2.29"E	1	AMC Campus	AMC Campus

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S. No.	Location Name	Latitude	Longitude	Fixed Bullet IR Camera	Location for DC Location	Location of CCC/ICCC Location
63.	Rajrooppur Pasiyana	25°26'19.38"N	81°47'55.23"E	1	AMC Campus	AMC Campus
64.	Rajrooppur Digajsingh School	25°26'9.75"N	81°47'15.70"E	1	AMC Campus	AMC Campus
65.	Rajrooppur 60 Road	25°26'10.04"N	81°47'17.84"E	1	AMC Campus	AMC Campus
66.	Shivala	25°26'55.45"N	81°45'8.29"E	1	AMC Campus	AMC Campus
67.	Draupadi	25°25'45.13"N	81°49'55.20"E	1	AMC Campus	AMC Campus
68.	Hatiya	25°25'59.10"N	81°50'31.09"E	1	AMC Campus	AMC Campus
69.	Mohatsimganj	25°26'35.99"N	81°50'22.73"E	1	AMC Campus	AMC Campus
70.	North Malaka	25°26'33.90"N	81°50'52.22"E	1	AMC Campus	AMC Campus
71.	SwaroopRani Hospital	25°26'44.25"N	81°50'49.96"E	1	AMC Campus	AMC Campus
72.	Fafamau	25°31'30.76"N	81°51'39.02"E	1	AMC Campus	AMC Campus
73.	Amitabh Bachan Pooliya	25°29'29.13"N	81°52'37.69"E	1	AMC Campus	AMC Campus

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S. No.	Location Name	Latitude	Longitude	Fixed Bullet IR Camera	Location for DC Location	Location of CCC/ICCC Location
74.	A.G Office	25°27'22.63"N	81°49'40.49"E	1	AMC Campus	AMC Campus
75.	Rajapur	25°27'51.87"N	81°50'11.20"E	1	AMC Campus	AMC Campus
76.	Krasthvat	25°26'2.61"N	81°51'30.46"E	1	AMC Campus	AMC Campus
77.	Bairahana	25°26'22.46"N	81°51'39.78"E	1	AMC Campus	AMC Campus
78.	Daraganj	25°26'33.72"N	81°52'54.55"E	1	AMC Campus	AMC Campus
79.	Sarai Bakshi Khurd	25°27'10.50"N	81°52'58.17"E	1	AMC Campus	AMC Campus
80.	Ashok Takeej	25°23'43.45"N	81°52'7.35"E	1	AMC Campus	AMC Campus
81.	Agriculture Maheva (khan chauraha)	25°24'51.02"N	81°50'47.90"E	1	AMC Campus	AMC Campus
82.	Naini Jail Road	25°24'28.66"N	81°51'57.84"E	1	AMC Campus	AMC Campus
83.	Naini Ward Office	25°23'41.09"N	81°52'0.56"E	1	AMC Campus	AMC Campus
84.	Naini Shani Mandir	25°23'56.13"N	81°52'11.92"E	1	AMC Campus	AMC Campus

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S. No.	Location Name	Latitude	Longitude	Fixed Bullet IR Camera	Location for DC Location	Location of CCC/ICCC Location
85.	Karbala	25°26'23.86"N	81°48'29.04"E	1	AMC Campus	AMC Campus
86.	Neem Sarai	25°27'36.07"N	81°45'25.31"E	1	AMC Campus	AMC Campus
87.	PanchMukhi	25°25'45.63"N	81°50'16.27"E	1	AMC Campus	AMC Campus
88.	Rasoolpur	25°25'37.39"N	81°49'27.51"E	1	AMC Campus	AMC Campus
89.	Mayapress	25°25'44.67"N	81°50'26.85"E	1	AMC Campus	AMC Campus
90.	Mandapam	25°26'15.52"N	81°50'35.99"E	1	AMC Campus	AMC Campus
91.	K P College	25°26'45.13"N	81°51'18.35"E	1	AMC Campus	AMC Campus
92.	Valmiki	25°26'56.65"N	81°49'14.79"E	1	AMC Campus	AMC Campus
93.	Laxmi Takeej	25°28'7.48"N	81°51'10.10"E	1	AMC Campus	AMC Campus
94.	Pahalwaan Veer Baba	25°28'33.36"N	81°52'16.10"E	1	AMC Campus	AMC Campus
95.	Haija Hospital	25°26'49.29"N	81°52'24.66"E	1	AMC Campus	AMC Campus

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S. No.	Location Name	Latitude	Longitude	Fixed Bullet IR Camera	Location for DC Location	Location of CCC/ICCC Location
96.	Payal Cinema	25°26'11.75"N	81°50'55.67"E	1	AMC Campus	AMC Campus
97.	Shankardhaal	25°23'44.42"N	81°51'50.96"E	1	AMC Campus	AMC Campus
98.	Leader Road	25°26'38.31"N	81°49'40.43"E	1	AMC Campus	AMC Campus

**14.9. Locations for Red Light Violation Detection (RLVD) System**

S. No.	Location Name	Latitude	Longitude	Total No. of Arms	No. of Arms to be covered	No. of Lanes to be covered	Location for DC Location	Location of CCC/ICCC Location
1.	PS Dhoomanganj Chauraha	25°27'1.97"N	81°43'30.37"E	4	2	4	AMC Campus	AMC Campus
2.	Government Press Chouraha/Eklavya Chouraha	25°27'15.84"N	81°49'37.04"E	4	4	8	AMC Campus	AMC Campus
3.	Dhobhi Ghat Chouraha	25°27'34.70"N	81°50'14.22"E	4	4	8	AMC Campus	AMC Campus
4.	Lok Sewa Aayog Chouraha	25°27'32.92"N	81°50'30.75"E	4	4	8	AMC Campus	AMC Campus
5.	GT Jawahar Chouraha	25°26'32.04"N	81°52'4.19"E	4	3	6	AMC Campus	AMC Campus
6.	Triveni Puram Chouraha	25°25'35.96"N	81°55'26.69"E	3	2	4	AMC Campus	AMC Campus
7.	Leprosy Chouraha	25°24'51.72"N	81°51'25.90"E	5	5	10	AMC Campus	AMC Campus
8.	Medical Chouraha	25°26'49.08"N	81°51'5.11"E	4	4	8	AMC Campus	AMC Campus
9.	Bangad Dharamshala Chouraha	25°26'24.74"N	81°51'47.18"E	4	3	6	AMC Campus	AMC Campus
10.	Bairhana Chouraha	25°26'22.94"N	81°51'38.85"E	4	4	8	AMC Campus	AMC Campus
11.	Fire Brigade Chouraha	25°26'49.81"N	81°50'24.09"E	5	3	6	AMC Campus	AMC Campus

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S. No.	Location Name	Latitude	Longitude	Total No. of Arms	No. of Arms to be covered	No. of Lanes to be covered	Location for DC Location	Location of CCC/ICCC Location
12.	Jhonson Ganj Chouraha	25°26'33.98"N	81°50'10.57"E	4	4	8	AMC Campus	AMC Campus
13.	Maha Rana Pratap Chouraha	25°27'39.44"N	81°50'31.35"E	4	4	8	AMC Campus	AMC Campus
14.	Traffic Police Lines Chauraha	25°28'0.11"N	81°50'36.95"E	4	3	6	AMC Campus	AMC Campus
15.	Teliyar Ganj Chauraha	5°29'54.90"N	81°51'47.13"E	4	2	4	AMC Campus	AMC Campus
16.	Shantipuram Chouraha	25°31'35.42"N	81°51'23.26"E	3	2	4	AMC Campus	AMC Campus
17.	Mazar Chauraha/NCC Ground	25°28'46.48"N	81°51'44.66"E	4	2	4	AMC Campus	AMC Campus
18.	Anand Hospital Chouraha	25°27'49.73"N	81°50'54.08"E	4	2	4	AMC Campus	AMC Campus



**14.10. Locations for Permanent Variable Message Display (VMD) for Pan City**

<b>S. No.</b>	<b>Location Name</b>	<b>Latitude</b>	<b>Longitude</b>	<b>Location for DC Location</b>	<b>Location of CCC/ICCC Location</b>
1.	OP Bamhrauli	25°27'1.97"N	81°43'30.37"E	AMC Campus	AMC Campus
2.	T.P. Nagar Tiraha	25°26'58.98"N	81°46'16.06"E	AMC Campus	AMC Campus
3.	Mahila Gram Tiraha	25°26'39.24"N	81°47'50.11"E	AMC Campus	AMC Campus
4.	Pani ki Tanki Chauraha (N.Y. Road)	25°26'58.26"N	81°49'1.02"E	AMC Campus	AMC Campus
5.	Government Press Chouraha/Eklavya Chouraha	25°27'15.84"N	81°49'37.04"E	AMC Campus	AMC Campus
6.	Dhobhi Ghat Chouraha	25°27'34.70"N	81°50'14.22"E	AMC Campus	AMC Campus
7.	Lok Sewa Aayog Chouraha	25°27'32.92"N	81°50'30.75"E	AMC Campus	AMC Campus
8.	Pt. MM Malviya Chauraha	25°27'7.26"N	81°50'36.84"E	AMC Campus	AMC Campus
9.	Geeta Niketan Tiraha	25°26'41.51"N	81°51'57.50"E	AMC Campus	AMC Campus
10.	GT Jawahar Chouraha	25°26'32.04"N	81°52'4.19"E	AMC Campus	AMC Campus
11.	Andawa Chauraha	25°25'40.20"N	81°56'5.85"E	AMC Campus	AMC Campus

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S. No.	Location Name	Latitude	Longitude	Location for DC Location	Location of CCC/ICCC Location
12.	Leprosy Chouraha	25°24'51.72"N	81°51'25.90"E	AMC Campus	AMC Campus
13.	Rambagh Bus Stand Chouraha	25°26'15.23"N	81°50'47.76"E	AMC Campus	AMC Campus
14.	Medical Chouraha	25°26'49.08"N	81°51'5.11"E	AMC Campus	AMC Campus
15.	Bangad Dharamshala Chouraha	25°26'24.74"N	81°51'47.18"E	AMC Campus	AMC Campus
16.	Harshvardhan Chouraha	25°26'2.78"N	81°51'39.38"E	AMC Campus	AMC Campus
17.	Bairhana Chouraha	25°26'22.94"N	81°51'38.85"E	AMC Campus	AMC Campus
18.	CMP Dot Pul West Side	25°26'40.13"N	81°51'34.52"E	AMC Campus	AMC Campus
19.	Lohia Chauraha (Civil Lines Bus Stand)	25°26'58.75"N	81°50'25.57"E	AMC Campus	AMC Campus
20.	Subhash Chouraha	25°27'1.01"N	81°50'4.40"E	AMC Campus	AMC Campus
21.	Pathar Girijaghar Chouraha	25°27'4.27"N	81°49'35.84"E	AMC Campus	AMC Campus
22.	Balmiki Tiraha	25°26'56.66"N	81°49'17.87"E	AMC Campus	AMC Campus
23.	Fire Brigade Chouraha	25°26'49.81"N	81°50'24.09"E	AMC Campus	AMC Campus

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S. No.	Location Name	Latitude	Longitude	Location for DC Location	Location of CCC/ICCC Location
24.	Jhonson Ganj Chouraha	25°26'33.98"N	81°50'10.57"E	AMC Campus	AMC Campus
25.	Railway Station Junction City Side Chouraha/Saalik Ram Chauraha	25°26'38.82"N	81°49'31.21"E	AMC Campus	AMC Campus
26.	Maha Rana Pratap Chouraha	25°27'39.44"N	81°50'31.35"E	AMC Campus	AMC Campus
27.	Traffic Police Lines Chauraha	25°28'0.11"N	81°50'36.95"E	AMC Campus	AMC Campus
28.	MNIT Tiraha	25°29'39.69"N	81°51'40.72"E	AMC Campus	AMC Campus
29.	Phaphamau Tiraha	25°31'19.05"N	81°51'59.83"E	AMC Campus	AMC Campus
30.	Govind pur Chauraha	25°29'35.34"N	81°52'19.25"E	AMC Campus	AMC Campus
31.	Bank Road Chauraha	25°28'11.92"N	81°51'44.82"E	AMC Campus	AMC Campus
32.	Lalla Chungi Chauraha	25°28'3.75"N	81°51'48.65"E	AMC Campus	AMC Campus
33.	Police Lines Main Gate Tiraha	25°27'40.83"N	81°50'45.73"E	AMC Campus	AMC Campus
34.	Collectorate Chauraha	25°28'1.29"N	81°51'0.61"E	AMC Campus	AMC Campus
35.	SSP Office Gate	25°28'7.09"N	81°51'7.78"E	AMC Campus	AMC Campus

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S. No.	Location Name	Latitude	Longitude	Location for DC Location	Location of CCC/ICCC Location
36.	BHS School	25°27'39.22"N	81°50'26.40"E	AMC Campus	AMC Campus
37.	Elgian chauraha next to polo ground	25°27'15.62"N	81°49'20.53"E	AMC Campus	AMC Campus
38.	Indira Murthi Chouraha	25°27'40.06"N	81°49'24.03"E	AMC Campus	AMC Campus
39.	Khuldabad Sabji Mandi Chouraha/Murkari Chauraha	25°26'20.93"N	81°49'23.62"E	AMC Campus	AMC Campus
40.	OP Bamhrauli	25°27'1.97"N	81°43'30.37"E	AMC Campus	AMC Campus

**14.11. Locations for Environmental Sensors**

S. No.	Location Name
1.	Purana Naini Bridge (Old)
2.	Manmohan Park Chouraha
3.	Medical Chouraha
4.	Dhobhi Ghat Chouraha
5.	GPO
6.	Jhonson Ganj Chouraha
7.	Bairhana Chouraha
8.	Chow Fatkha
9.	Thana Dhoomanganj Chouraha
10.	Mundera Market
11.	Fire Brigade Chouraha

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S. No.	Location Name
12.	High Court Hanuman Mandir Chouraha
13.	Subhash Chouraha
14.	Hindu Hostel Chouraha
15.	UPSC Chouraha
16.	Lalla Chungi Chouraha
17.	Chota Akhada Railway Crossing
18.	Mayo Hall Chouraha/Rana Pratab Chouraha
19.	Teliyar Ganj Govindpur Crossing
20.	Sobatiya Bagh Under Daat pur Near Sangam Petrol Pump
21.	Laxmi Talkies Chouraha
22.	Laxmi Narayan Chouraha

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S. No.	Location Name
23.	Chandralok Chouraha
24.	Allahabad Junction Station Leader Road Chouraha
25.	Meerapur Gol Park towards ECC Park
26.	Khuldapur Police Chowki
27.	Pani ki Tanki Chouraha
28.	Balson Chouraha

**14.12. Locations of Bus Shelters for LED PIS Display**

S. No.	Location Name
1.	Subhash Chauraha Civil Lines (both sides)
2.	Saraswati civil line (both sides)
3.	Janhavi civil lines
4.	Yamuna Civil lines
5.	Mandakni Civil ines
6.	Alopibagh (both sides)
7.	Medical Chauraha
8.	Medical College
9.	Patthar Girja (both sides)
10.	Bank Road(both sides)
11.	Anand Bhawan



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S. No.	Location Name
12.	Balson Chauraha
13.	Jhunsi Thana
14.	P.D Park civil lines
15.	Teliyarganj
16.	Hamunan Mandir Civil Lines