



Model RFP 2.0

Selection of Master System Integrator (MSI)

For Implementation of

Integrated Command and Control Center

(ICCC)/ ICT Projects

in {CITY_NAME}

Section-3 Volume II: Scope of Work

Smart Components

RFP Ref/Tender No.:

Date:

RFP/Tender invited by: [SPV_Full_NAME]

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[The Authority may customize as per city's requirement]

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Glossary

Terms	Meaning
ANPR	Automatic Number Plate Recognition
AP	Access Points
ATCS	Adaptive Traffic Control System
AVLS	Automated Vehicle Locator System
BOM	Bill of Material
BQS	Bus Queue Shelters
CCHS	Central Clearing House Solution
CCTV	Closed Circuit Television
CCC	Command and Control Center
CONOPS	Concept of Operations
COP	Common Operating Platform
CSP	Cloud Service Provider
DBA	Database Administrator
DC	Data Center
DeitY	Department of Electronic & Information Technology
DNS	Domain Name Server
DR	Disaster Recovery
DRC	Disaster Recovery Center
EMD	Earnest Money Deposit
EMS	Enterprise Management System
ETA	Estimated Time of Arrival
ETD	Estimated Time of Departure
ETM	Electronic Ticketing Machine
E-Procurement Portal	Means electronic tendering system of Authority
FMS	Facility Management Services
FRS	Functional Requirement Specifications
GIS	Geographical Information Systems

GPRS	General Packet Radio Service
GPS	Global Positioning System
GSM	Global System for Mobile Communication
GUI	Graphical User Interface
IaaS	Infrastructure as a Service
HDPE	High-Density Polyethylene
HO	Head Office
ICCC	Integrated Command and Control Center
ICT	Information and Communication Technology
IDS	Intrusion Detection System
IOE	Internet of Everything
IoT	Internet of Things
IP	Internet Protocol
IPS	Intrusion Prevention System
IT	Information Technology
ITIL	Information Technology Infrastructure Library
ITMS	Intelligent Traffic Management System
LAN	Local Area Network
LOI	Letter of Intent
LOA	Letter of Award
KPI	Key Performance Indicator
MCC	Mobile Command Center
MeitY	Ministry of Electronics & Information and Technology
MLCP	Multi-Level Car Parking
MoHUA	Ministry of Housing & Urban Affairs
MoU	Memorandum of Understanding
MPLS	Multi-Protocol Label Switching
MSI	Master System Integrator
MTBF	Mean Time Between Failure

MTTR	Mean Time to Repair
NFC	Near Field Communication
NIC	National Informatics Centre
ONVIF	Open Network Video Interface Forum
O&M	Operations and Maintenance
OEM	Original Equipment Manufacturer
OFC	Optical Fiber Cable
OGC	Open Geospatial Consortium
OS	Operating System
OTP	One Time Password
OWASP	Open Web Application Security Project
PaaS	Platform as a Service
PKI	Public Key Infrastructure
PIS	Public Information System
PA System	Public Address System
PDUs	Power Distribution Units
PIS	Passenger Information System
PoE	Power over Ethernet
PoP	Point of Presence
PTZ	Pan Tilt Zoom
QR Code	Quick Response Code
RF	Radio Frequency
RFID	Radio Frequency Identification
RFP	Request for Proposal
RLVD	Red Light Violation Detection
RoW	Right of Way
RTO	Recovery Time Objective
RPO	Recovery Point Objective
SaaS	Software as a Service

SCADA	Supervisory control and data acquisition
SCM	Smart Cities Mission
SLA	Service Level Agreement
SMPS	Switched Mode Power Supply
SMS	Short Message Service
SNMP	Simple Network Management Protocol
SOP	Standard Operating Procedures
SOS	Save Our Souls. SOS is International Morse code distress signal
SRS	System Requirement Study
TPA	Third Party Auditor
TRAI	Telecom Regulatory Authority of India
TRS	Technical Requirement Specifications
TSP	Telecom Service Provider
UAT	User Acceptance Testing
UPS	Uninterrupted Power Supply
URL	Uniform Resource Locator
VA	Video Analytics
VM	Virtual Machine
VMD	Variable Message Display
VCA	Video Content Analysis
VLAN	Virtual Local Area Network
VM	Virtual Machine
VMS	Video Management Software/System
WAN	Wide Area Network
{MUNICIPAL_SHORT_NAME}	{MUNICIPAL_FULL_NAME}
{SPV_FULL_NAME}	Authority

Component 1- Emergency Call Box

1.1 Overview

Authority has planned to install Emergency call boxes (ECBs) in the city at various intersections, public places, critical and strategic locations as identified by Authority. To allows citizens to establish audio and video communication with the ICCC in case of any emergency.

The purpose is to help citizen reach-out designated support staff in ICCC to get assistance in case of any exigency/ mishap/to report an incidence such as Collision, illness or other non-criminal incident requiring medical support, requiring disaster /task force /police/security response on location/site, other incidences like eve teasing etc.

1.2 Scope of work

A total nos. of ECBs are proposed to be installed at strategically locations [City to provide details] in the city within the vicinity of constant Police supervision or CCTV field of view to avoid-misuse and vandalism. The ECBs are required to be suitably sized and identified/clearly labelled for “Emergency”.

The MSI shall install the ECBs in consultation with Authority. The MSI shall ensure effectiveness in communicating information about emergency or disaster related incidences/conditions at major/critical risk zones or vulnerable public areas in the city {CITY_NAME}.

1.2.1 Functional Requirements

Make: <to be provided by the bidder>

Model: <to be provided by the bidder>

#	Functional requirement	Bidder's Response (How functionality will be met)
I.	The Emergency Call Box (ECB) system shall be IP based and should have the capability to be managed and controlled from the ICCC.	
II.	It should be easily accessible by public for emergency two-way communication, preferably with a Double button which when pressed, shall connect to ICCC.	
III.	Provide ability to converse virtually through the exchange of text, audio, and/or video-based information in real time with one or more individuals.	

IV.	Enable citizens to establish a two-way audio (microphone and speaker) communication with ICCC through a press of a button.	
V.	It should be have integration with Contact Centre/Helpdesk at the ICCC	
VI.	Status of all ECBs (Operational/non-operational) should be displayed in ICCC.	
VII.	It should be possible to control individual Emergency call boxes i.e. to make or receive an input /announcement at selected/identified location (1:1) and all locations (1: many) simultaneously. The ECB should also support real time dynamic inputs.	
VIII.	Access control mechanism would be also required to establish so that the usage is regulated	
IX.	[Add more/Modify]	

1.2.2 Technical requirement

[The Authority may include the component specific technical requirement here which are vendor/technology agnostic]

S.No.	Technical requirement	Bidder response (How the functionality will be met?)
1		
..n		

1.2.3 Physical/Civil infrastructure requirement

MSI shall be responsible for carrying out all the physical/civil work required for setting up ECB system. The MSI shall undertake survey, location finalization in coordination/approval from Authority. The MSI scope shall include, but not limited to:

- a) Hard/soft soil deep digging and backfilling after cabling.
- b) Preparation of concrete foundation for installing Emergency call boxes on Poles.
- c) Install Poles (of required size and specifications) at identified locations
- d) Ensuring identified public locations for lateral clearance as well as a vertical clearance height as per Public Works Departments/ road repair division following IRC NHAI (National Highway Authority of India) guidelines.
- e) Installation of ECBs, junction boxes etc.

- f) Coordination with relevant authorities for permission to install Emergency call boxes and associated infrastructure. No commercial/legal fees (except the RoW charges) shall be applicable to Authority for obtaining the necessary permissions.
- g) To ensure all the installation components of Emergency call boxes are vandal proof.
- h) MSI shall ensure while installing the ECBs the norms of Street planning & design regulations/guidelines, Road & intersection design guidelines & NHAI (National Highway Authority of India) guidelines.
- i) The MSI shall provide all material required for mounting of components for ECBs and necessary field equipment's.
- j) In case the equipment/sensors get damaged /stolen for reasons whatsoever, it shall repair/replace the same in the specified time as per SLAs at no extra cost to the Authority.

1.2.4 Electrical requirements

- a) MSI shall provision for electricity connection to the Emergency call boxes through an aggregation point. Since this component has dependency on approval from local authorities, it is recommended that MSI plans this requirement well in advance & submits the application to the concerned electricity distribution agency with requisite fees, as applicable.
- b) MSI shall carry out the electrical & allied works required for powering all the components of Emergency call box system.
- c) MSI shall ensure that all the Emergency call boxes its installation and wirings/cables shall conform to the Indian codes & standard of Bureau of Indian standards.

1.2.5 Network Connectivity requirements

Please refer RFP Volume II Section 1 for relevant details regarding network connectivity.

1.3 Bill of Material

S.No.	Description	Unit	Quantity
I.	Supply of Number/ type of(nos) Emergency call boxes of (<Size>)		
II.	Supply of ECB software.		
III.	Physical/Civil work		
IV.	Provision of electricity connections to the ECBs.		
V.	Installation, Testing and Commissioning Charges for all Emergency call box system infrastructure		

VI.	UAT and handover charges		
VII.	Integration with ICCC system (Specify the integration requirements)		
VIII.	Operation and Maintenance (O&M) for 5 years		

Note 1: Add rows above if required, as per number of items

Note 2: The items to be quoted as per the functional requirement given in Section 1.2.1 above.

1.4 ICCC Integration requirements

- Aggregate various data, communication and feeds from Emergency call boxes.
- Provide interface/dashboards report alarm, generating alert and notifications in real time.
- Provide single dashboard of various ECBs.
- Event correlation and development of use-case / SoPs
- Configure thresholds, generate alert and trigger SOPs
- Integration with GIS map and dashboard.
- [Add more/Modify]

1.5 Operation and maintenance

The MSI shall provide a comprehensive Operation & Maintenance of the ECB system for a period of 5 Years from the date of go-live. Following are the indicative activities, the MSI shall perform during O&M period:

- Rectification of faults, replacing defective or non-operational items as per agreed SLA
- End device security, including physical security
- Regular cleaning of ECBs box to keep it free of dust/dirt
- Provide reports on utilization and efficiency as per defined KPIs.
- Repair/replace any equipment/ accessory that gets damaged /stolen for any reasons whatsoever, in the specified time as per SLAs, at no extra cost to the Authority.
- Ensure Preventive maintenance of entire infrastructure once in a quarter and submit to Authority or its designated agency along with detailed finding and dependencies.
- In case of request for change in location of field equipment post the handover of the system, the same shall be borne by Authority at either a unit rate as per commercials or a mutually agreed cost after XX number of requests during the contract period.

Key performance indicators (KPIs) to be monitored under an SLA.

- Provide location of Emergency call boxes and operational status on GIS map.
- Identify any abnormalities in the Emergency call boxes and provide notifications to ICCC for proactive maintenance
- [Add other Baselineing and monitoring parameters]

Component 2- Information Kiosk

2.1 Overview

Authority has planned to install Kiosks at specific locations in the city which offer great interactive possibilities that offer people extra service and at the same time have a cost-reducing effect on the organization providing it. The information Kiosk will help in:

- Reducing personnel costs through facilitation of self-service
- Paying utility bills like water tax, property tax, electricity bills etc.
- Accelerating processes through attractive and easy menus
- Offering customized route descriptions with wayfinding kiosks, equipped with a real or virtual keyboard
- Triggering passers-by with general information, enticing them to touch the screen and have a message delivered about anything
- Register visitors automatically using a card swipe or scan and alleviate wait time by offering content that is informative, educating or entertaining.

2.2 Scope of work

The informational Kiosks shall be installed at identified strategic locations [City to provide details]. They should be installed at key locations equipped with a range of services, to increase mobility and visibility of citizen-centric services. These kiosks shall be used by the citizens for gathering information about a particular place, travel options within the city, payment options etc. Multi utility kiosks serving several citizen services should be installed seeing the density of population ward-wise as well as level of acceptance of citizens of a respective ward.

Kiosks shall be managed and operated from the ICCC and also integrated with the city app where information shall be fed in a manner to be displayed on a specific Kiosk installed at a particular location or across all locations.

The MSI shall provide kiosks that are interactive terminals shall be a standalone structure with following components: easy to use software interface along touch screen for citizen services with payment options (integrated with Common Payment Platform, e-wallets, debit and credit cards), CPC reader (with additional security features such as PIN), bill/ticket printer etc.

The MSI shall describe in detail the design, operational and physical requirements of the proposed kiosks to demonstrate compliance with all the specified requirements in this RFP.

2.2.1 Functional Requirements

Make: <to be provided by the bidder>

Model: <to be provided by the bidder>

#	Functional requirement	Bidder's Response (How functionality will be met)
I.	Information Kiosks	
II.	Provide simple UI based content Authoring tool	
III.	Provide web based powerful Content Manager and a playback engine	
IV.	Built-in template engine	
V.	Drag-and-Drop media items, easy creation and editing of playlist	
VI.	Support layering of Video with other content types	
VII.	Images, Videos, Flash, HTML and RSS feeds, IPTV, Live Streaming support	
VIII.	Tickers and Crawling Graphics support	
IX.	Manage content by categories and conditional playback rules for media items in playlists and sub-playlists	
X.	Assign roles and permissions to allow multiple content creators, managers and approvers. Creating associations between content, playlists and groups of users using workgroups	
XI.	Delivery to multiple screen groups/screen attributes	
XII.	Content expiration by date	
XIII.	Bring in live feeds such as news, weather, traffic, financial data and social media.	
XIV.	Auto population of content playlists Based on Criteria	

XV.	Emergency Messages display by overriding all the running content	
XVI.	Content Scheduling and playback based on event and time triggers	
XVII.	Make your own design, choose from the many templates and customize them to your style or use marketing materials that are made with your favorite tools	
XVIII.	Inventory download status check and monitoring details of player inventory remotely.	
XIX.	Set non peak timings to download the inventory	
XX.	Stable and Reliable performance 24 hours a day and 7 days a week	
XXI.	Superior playback technology delivering smooth sub-pixel motion without distracting choppy, stutters	
XXII.	Player to only download changes, not the entire content	
XXIII.	Connect with virtually any data and content source	
XXIV.	Ability to schedule and control messages on one or many screens	
XXV.	Reports of content playback by media items and by players	
XXVI.	Remote view of player status and player problems	
XXVII.	Synchronized content playback	
XXVIII.	Remote management of hardware (eg: Switch OFF/ON Screens)	
XXIX.	Network bandwidth Throttling	
XXX.	Secure and Encrypted communication	
XXXI.	Generate playback audit report by players, player groups, media Items or any predefined criteria	
XXXII.	Support multiple foreign languages and capability of rendering content in regional and foreign languages	

XXXIII.	Support 2D transitions and many 3D transitions	
XXXIV.	Self-Healing Mechanism: Recover from any software level fault	
XXXV.	Service Data exchange standards	
XXXVI.	<p>metadata repository of various standards which may be established with multiple partners.</p> <p>Interface with various service providers, develop standards for information exchange as required for delivery of services through City Kiosk machines.</p> <p>Open standards for data exchange shall be preferred.</p>	
XXXVII.	[Add more/Modify]	

2.2.2 Technical requirement

[The Authority may include the component specific technical requirement here which are vendor/ technology agnostic]

S.No.	Technical requirement	Bidder response (How the functionality will be met?)
1		
..n		

2.2.3 Physical/Civil requirement

For installing kiosks, the MSI shall conduct a detailed assessment of any existing Kiosks systems and develop a comprehensive project plan, including:

- a) Assess the existing kiosks used around {CITY_NAME} and site survey
- b) Site Survey and feasibility study for Kiosks
- c) Finalization of detailed technical architecture, gap analysis and project plan
- d) Obtain site Clearance obligations & other relevant permissions

The site analysis should be done based on the location for installation of the kiosks. MSI shall identify and obtain necessary legal/statutory clearances where required

All associated hardware and installation shall be under the scope of MSI including kiosk mounting, theft and vandal proof casing, network connectivity, etc.

MSI shall be responsible for carrying out all the civil work required for setting up all the field components (where applicable) including:

- a) Preparation of concrete foundation
- b) Laying of GI Pipes (min B Class) complete with GI fitting
- c) Hard/soft soil deep digging and backfilling after cabling
- d) Chambers with metal cover at every junction box, pole and at road crossings
- e) MSI shall provide & manage all necessary paperwork to pursue permission from respective authorities. No commercial/legal fees (except the RoW charges) shall be applicable to Authority for obtaining the necessary permissions. These shall be provisioned for by the MSI in their price bid.
- f) Authority shall assist in obtaining all necessary go ahead, legal permissions, NOC (No Objection Certificate) from various departments to execute the project.
- g) The MSI shall provide all material required for mounting of components for Kiosks and other field equipment. The MSI shall also get comprehensive insurance from reputed insurance company for the project duration for all the equipment's / components installed.
- h) MSI shall ensure all the equipment's installed in the outdoor locations are vandal proof and in case the equipment's get damaged /stolen for reasons whatsoever, it shall repair/replace the same in the specified time as per SLAs at no extra cost to the Authority.

2.2.4 Electrical requirement

- a) MSI shall provide electricity to the information kiosks through an aggregation point. Since this component has dependency on approval from local authorities, it is recommended that MSI plans this requirement well in advance & submits the application to the concerned electricity distribution agency with requisite fees, as applicable.
- b) MSI shall carry out all the electrical work required for powering all the components of the system.
- c) Electrical installation and wiring shall conform to the electrical codes of India.
- d) The electricity meters, if any, should be placed inside a power cabinet.

2.2.5 Network Connectivity requirements

Please refer RFP Volume II Section 1 for relevant details regarding network connectivity. The network connectivity can be through OFC Network or through 3G/4G SIM cards. All cost related to SIM card based connectivity shall be borne by the MSI.

2.3 Bill of Material

#.	Description	Unit	Quantity
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i.	Supply of Information Kiosks of (<Size>)		
ii.	Provisioning of the network connectivity at identified locations.		
iii	Supply of IT infrastructure (Hardware/Software/middleware) including data security		
iv	Physical/Civil work		
v	Provision of Electrical connections		
vi	Installation, Testing and Commissioning Charges		
vii	Integration with ICCC system (Specify the integration requirements)		
viii	UAT and handover charges		
ix	Operation and Maintenance (O&M) for 5 years		

Note 1: Add rows above if required, as per number of items

Note 2: The items to be quotes as per the functional requirement given in Section 2.2.1

2.4 ICCC Integration requirements

- Aggregate various data, communication and feeds from information Kiosk.
- Provide interface/dashboards report alarm, generating alert and notifications in real time.
- Provide single dashboard of various Kiosks
- Event correlation and development of use-case / SoPs
- Configure thresholds, generate alerts and trigger SOPs
- Integration with GIS map and dashboard.
- [Add more/Modify]

2.5 Operation and maintenance

- The MSI is to provision for hardware, software, connectivity, installation, commissioning and ensure the desired working of information kiosks at identified locations
- The MSI should plan for the kiosk to be available 24X7 with power provisioning and backup for at least 4 hours in case of power failure.
- The MSI shall ensure that the kiosks have easy to understand menu options in both Hindi (or local language) and English.

Key performance indicators (KPIs) to be monitored under an SLA.

- Provide location and operational status on GIS map.
- Identify any abnormalities in the information Kiosk and provide notifications to ICCC for proactive maintenance.
- [Add other Baseline and monitoring parameters]

Component 3- Public WIFI

3.1 Overview

Authority has planned to install Public Wi-Fi (Hotspot Wi-Fi) in {CITY_NAME} to serve as the foundation for creating a connected city to access the wireless internet service with ease and convenience.

The objective is to implement wireless networking technology that uses radio waves to provide wireless high-speed Internet and network connections.

3.2 Scope of work

A total nos. of Wi-Fi locations are required to be made operation at strategic locations [City to provide details], Including places with high footfall.

The MSI shall install the Wi-Fi access points in consultation with Authority.

The MSI shall deploy the access points along with other IT infrastructure such as Wi-Fi controller, DNS, Internet bandwidth, Wi-Fi Management application, Power over Ethernet devices, L2 and L3 Managed switches, Routers, UPS, passive components i.e UTP, OFC, Electrical power, racks etc.

MSI shall properly Wall Mount/ Pole Mount the Access Points at approved locations with external mounting kit as per OEM standard practice.

The MSI shall be responsible for integrating the Wi-Fi Network with the existing LAN/WAN network.

3.2.1 Functional Requirements

Make: <to be provided by the Bidder>

Model: <to be provided by the Bidder>

#	Functional requirement	Bidder's Response (How functionality will be met)
I.	All intended coverage areas must be covered with wireless AP/array for high rate data applications.	
II.	For density concerns, there must be multiple radios per area. Each wireless AP/array must be able to scale without adding additional controllers or user licenses.	
III.	The Wi-Fi controller should be configured with 1 + 1 in Active-Active Load Balancing mode	

IV.	It should be ready for supporting(Nos) AP's and (Nos) devices from day one to run in Active-Standby / Active-Active Load Balancing Mode, with scalability for (nos)AP support in future.	
V.	Each AP (not system) must support per SSID traffic shaping and limiting at line rate at the Access Point (not controller). This is to prevent additional data on the network	
VI.	Each AP must employ a future-proof modular architecture for upgradability to future standards	
VII.	System must include a centralized management system for central management of all devices across the network.	
VIII.	Wherever applicable, MSI shall have to integrate the existing wired LAN and internet links to the Wi-Fi solution	
IX.	A secure Wi-Fi connectivity and internet access should be ensured through user Login ID and password to all the subscribers with central authentication mechanism	
X.	Unique user ID and Password should not have provisions for simultaneous multiple logins	
XI.	Central Control Software Policy on validity of the user ID and Password for internet access should be configurable as per the requirement.	
XII.	programming to Wi-Fi access points (APs) must be configured to use cryptographic keys or other methods to ensure that only authenticated users can use the Wi-Fi services	
	Internal / External AAA server should be deployed ensuring DOT guidelines for providing public Wi-fi access. The log trails for any specific user shall be made available online for at least last 3 months and the backup shall be kept for one year.	
XIII.	The Wi-Fi network should be secure and conform to the industry standard security requirement. MSI shall suggest and help Authority team to deploy policies at various levels (i.e. on firewall, IDS, antivirus etc.) to prevent any attack/intrusion in the Wi-Fi network Provide airtime management and billing system for any paid content management	

XIV.	The facility for integrating the available payment gateway(s) at Authority for making online payments (if any) according to respective plans for internet usage should be available.	
XV.	Integration with the available SMS gateway (HTTP) at Authority for automatically sending the required details/ information through SMS to the users as per the requirement e.g. during user registration, forgot password, password reset etc, should be available.	
XVI.	Provide Access to the system only after the authentication and acceptance of authentication based on security policies	
XVII.	The architecture should provide resiliency and ensure that there are no single points of failure in the key components. To take care of remote failure, the systems need to be configured to mask and recover with minimum outage.	
XVIII.	The architecture should adopt an end-to-end security model that protects data and the 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, complying to cyber security model framework specified in this RFP in section....	
XIX.	Provide 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.	
XX.	[Add more/Modify]	

3.2.2 Technical requirement

[The Authority may include the component specific technical requirement here which are vendor/ technology agnostic]

S.No.	Technical requirement	Bidder response (How the functionality will be met?)
1		
..n		

3.2.3 Physical/Civil requirement

The MSI shall be required to carry out survey at the identified locations and will submit site wise survey report to Authority mentioning the location and number of Access Points (APs) required to be installed at each site.

MSI shall identify and obtain necessary legal / statutory clearances for erecting the poles and provisioning of the required power, etc. No commercial/legal fees (except the RoW charges) shall be applicable to Authority for obtaining the necessary permissions. These shall be provisioned for by the MSI in their price bid.

Authority shall assist in obtaining all necessary go ahead, legal permissions, NOC (No Objection Certificate) from various departments to execute the project.

For installing Wi-Fi, the MSI shall provide poles as required at various locations. If there is any requirement of additional poles for installation of Access Points, the same will be provided by MSI at its own cost with prior approval from Authority.

MSI shall be responsible for carrying out all the civil work required for setting up all the field components of the system including:

- a) Preparation of concrete foundation for Poles.
- b) Laying of GI Pipes (min B Class) complete with GI fitting
- c) Hard/soft soil deep digging and backfilling after cabling
- d) Soft soil deep digging and backfilling after cabling
- e) Chambers with metal cover at every junction box, pole and at road crossings
- f) Concrete foundation from the Ground for outdoor racks
- g) In case the equipment/sensors get damaged /stolen for reasons whatsoever, it shall repair/replace the same in the specified time as per SLAs at no extra cost to the Authority.

3.2.4 Electrical requirement

- a. MSI shall provide electricity to the Wi-Fi setup through an aggregation point. Since this component has dependency on approval from local authorities, it is recommended that MSI plans this requirement well in advance & submits the application to the concerned electricity distribution agency with requisite fees, as applicable.
- b. MSI shall carry out all the electrical work required for powering all the components of the system
- c. Electrical installation and wiring shall conform to the electrical codes of India.
- d. The electricity meters, if any, should be placed inside the power cabinet.

3.2.5 Network Connectivity requirements

Please refer RFP Volume II Section 1 for relevant details regarding network connectivity.

3.3 Bill of Material

#.	Description	Unit	Quantity
I.	Supply of Wi-Fi access points		
II.	Provisioning of the network connectivity at identified locations.		
III.	Supply of IT infrastructure (Hardware/Software/middleware) including data security		
IV.	Physical/Civil work		
V.	Provision of Electrical connections		
VI.	Installation, Testing & Commissioning Charges		
VII.	UAT and handover charges		
VIII.	Integration with ICCC system (Specify the integration requirements)		
IX.	Operation and Maintenance (O&M) for 5 years		

Note 1: Add rows above if required, as per number of items

Note 2: The items to be quoted as per the functional requirement given in Section 3.2.1

3.4 ICCC Integration requirements

- ICCC should integrate with Wi-Fi solution and project real-time user information on city dashboard
- WIFI solution should integrate with SMS and payment gateway solutions for required functionality
- Integration with GIS map
- [Add more/Modify]

3.5 Operation and maintenance

Following are the indicative activities the MSI shall perform during O&M period:

- The MSI need to ensure that adequate spares are retained at all times to meet onsite warranty/support and SLA requirements
- The maintenance services involve comprehensive maintenance of all components covered under the contract, including repairing, replacement of parts, modules, sub-modules, assemblies, sub-assemblies, spares part, updating, security alerts and patch uploading etc. to make the system operational
- MSI shall insure theft protection of all APs throughout the MSI period
- MSI shall also get comprehensive insurance from reputed insurance company for the project duration for all the equipment's / components installed under this project.
- MSI shall ensure all the equipment's installed in the outdoor locations are vandal proof and in case the equipment's get damaged /stolen for reasons whatsoever, it shall repair/replace the same in the specified time as per SLAs at no extra cost to the Authority.
- Preventive maintenance shall be carried out once in a quarter along with corrective maintenance and also when calls are placed by Authority or its designated agency. The key activities, including cleaning of equipment's/components under preventive maintenance shall be specified by the MSI in his technical bid.
- The MSI should ensure timely cleaning of all field level equipment's/components

In case of request for change in location of field equipment post installation handover, the same shall be borne by Authority at either a unit rate as per commercials or a mutually agreed cost after **XX number** of requests during the contract period.

Key performance indicators (KPIs) to be monitored under an SLA.

- Provide location/status and operational status on GIS Map.
- Identify any abnormalities and provide notifications to ICCC for proactive maintenance.
- **[Add other Baselineing and monitoring parameters]**

Component 4- Streetlight

4.1 Overview

Traditional street lighting systems lead to higher energy consumption and increased maintenance costs. Accordingly, to have a long-term sustenance, it is prudent to implement latest energy efficient smart street lighting system.

Authority intends to implement an energy efficient smart streetlight System in {CITY_NAME} within existing landscape to minimize energy usage and improve safety and security of the citizens.

Currently, in the existing traditional streetlight system, the city is facing challenges such as:

- High energy consumption which results in high amount of generated energy.
- Lack of information about the real time status of the streetlights
- Lack of proper system for monitoring and operating lights ON/OFF schedule
- Lack of system to optimize the efficiency of streetlight system, fault detection & replacement etc.
- Lack of system to enhance citizens' security by lighting dark areas in human presence.
- Lack of a centralized system to view real time energy consumption, current light status etc.

The Authority is looking for implementation of [Total No. of streetlight] streetlights along with ambient light sensors/controllers and smart streetlight management system with facility of automated controls to adjust the light based on ambience conditions to regulate the intensity & energy consumption and provide real time monitoring.

4.2 Scope of work

The city currently has about [Total No. of streetlights] traditional streetlights installed throughout the city. Out of these [Total No. of streetlight] are required be replaced with Smart LED streetlights/floodlights.

The city also has [Total No. of streetlight] LED Street Lights working in the city which are required to be integrated with proposed smart streetlight System.

Total No. of High Masts required with LED - []

Total No. of LED Street Lights required. - []

The existing streetlights to be retrofitted with particular wattage of LED luminaire in line with the specifications and as per national lighting code, as published by the bureau of Indian standard (BIS).

The scope shall also include implementing streetlight feeder panels with feedback facility using GSM/GPRS/ETHERNET technology or any other compatible technology to communicate with LED luminaire.

The MSI is expected to carry out field surveys to verify the status of switching points, physical installations, geographic area covered, and scope of the project defined so as to familiarize on the existing field conditions and the scope. They will also be responsible for reviewing the baselines established pursuant to Energy Audits undertaken by the city time to time. MSI shall also identify necessary legal / statutory clearances required for erecting and installing the streetlight poles.

The MSI is also required to provide a lighting management system to be integrated with the ICCC.

[add further scope as applicable)

4.2.1 Functional Requirements

Make: <to be provided by the bidder>

Model: <to be provided by the bidder>

#	Functional requirement	Bidder's Response (How functionality will be met)
	The system shall provision for:	
I.	Individual switch on/off, increase/decrease luminosity as per ambience.	
II.	Operate the streetlights in three states (DIM/Bright/Off) automatically as per weather conditions.	
III.	Enhance security by lighting dark areas in human presence	
IV.	Policy based Operation. Example: set up policies like light up alternate lights during low traffic density, increase the luminosity of the lights as per the dullness of the daylight etc. enhance security by lighting dark areas in human presence, time-based scheduling with intelligent weather adaptive lighting control.	
V.	Real time status of the streetlights on a city map for tracking and management of streetlights. The System should be able to display failure status of any Lights at ICCC with location and attributes.	
VI.	Automatically switched on /off on the basis of lux level with a manual override. The manual override information should be available at ICCC.	
VII.	Amount of electricity used in street lighting. There should be information about the amount of natural lux levels and that created by the streetlights to help allocating the amount of power required for streetlights. The same analysis would also be used for changing the source of power to alternate/renewable power in future.	

VIII.	Capacity management report to help analyze if any Light has fused before time (before burn hours as specified in the supplier's documentation.)	
IX.	Learning occupancy pattern & predict occupancy state for future planning	
X.	SLA management and security, audit compliance	
XI.	Automatic status updates or failure alerts to ICCC	
XII.	Detect failures of LED bulbs and other circuitry and generate alarms for maintenance automatically	
XIII.	Provide role-based access Rights to different modules / Sub-Modules / Functionalities and proper log report should be maintained by the system for such access.	
XIV.	Crowd sourcing or defective light reporting	
XV.	Flexibility to change the time scale from 1 hr. to 1 year, with daily, weekly, monthly, quarterly and yearly views of the reports	
XVI.	Learn the existing occupancy pattern and predict occupancy patterns for future planning	
XVII.	[Add more/Modify]	

4.2.2 Technical requirement

[The Authority may include the component specific technical requirement here which are vendor/technology agnostic]

S.No.	Technical requirement	Bidder response (How the functionality will be met?)
1		
..n		

4.2.3 Physical/Civil infrastructure requirement

The MSI shall be responsible for carrying out all the civil work required for setting streetlight infrastructure including, but not limited to:

- a) Survey, location finalization in coordination/ approval from Authority. Lighting flux spacing and placement of streetlights need to be specified depending on the length /area that need to be lit.

- b) The MSI shall consider length /area of illumination for lateral clearance as well as a vertical clearance height as per Public Works Departments/ road repair division following IRC NHAI (National Highway Authority of India) guidelines.
- c) Preparation of concrete foundation for Street light poles.
- d) Install Provide Gantry/Pole (of required size and specifications) with spans, at various locations (single lane road, double lane road) for installation of streetlights.
- e) Installation of LED fittings fixtures and luminaires.
- f) Hard/soft soil deep digging and backfilling after cabling.
- g) Chambers with metal cover at every junction box, pole and at road crossings.
- h) Coordination with relevant authorities for permission to erect poles and other infrastructure. No commercial/legal fees (except the RoW charges) shall be applicable to Authority for obtaining the necessary permissions.
- i) To ensure all the smart Lighting equipment's installed in the outdoor locations are vandal proof.
- j) In case the equipment/sensors get damaged /stolen for reasons whatsoever, it shall repair/replace the same in the specified time as per SLAs at no extra cost to the Authority.

4.2.4 Electrical requirements

- MSI shall provision for electricity connection to the streetlights through an aggregation point. Since this component has dependency on approval from local authorities, it is recommended that MSI plans this requirement well in advance & submits the application to the concerned electricity distribution agency with requisite fees, as applicable.
- MSI shall carry out the electrical work required for powering all the components.
- MSI shall ensure that all the Electrical installations, Lighting, fixtures, Luminaires and wirings/cables shall conform to the Indian electrical codes street lighting standard, Bureau of Energy Efficiency (BEE) and Energy Efficiency Street lighting -EESL recommendations of India.
- The electricity/ flux meters/ lighting sensors if any, should be placed inside a power cabinet.

4.2.5 Network Connectivity requirements

Please refer RFP Volume II Section 1 for relevant details regarding network connectivity. The network connectivity can be through OFC Network or through 3G/4G SIM cards. All cost related to SIM card-based connectivity shall be borne by the MSI.

4.3 Bill of Material

#.	Description	Unit	Quantity
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i.	Supply of type ____ (Nos) Street light luminaires & fixtures of (<Size>)		
ii.	Provisioning of the lights-based sensors at identified locations.		
iii.	Lighting management software		
iv.	Physical/Civil work		
v.	Provision of Electrical connections to the lights		
vi.	Installation, Testing and Commissioning Charges		
vii.	UAT and handover charges		
viii.	Integration with ICCC system (Specify the integration requirements)		
ix.	Operation and Maintenance (O&M) for 5 years		

Note 1: Add rows above if required, as per number of items

Note 2: The items to be quotes as per the functional requirement given in Section 4.2.1 above.

4.4 ICCC Integration requirements

Minimum integration requirements shall be:

- Aggregate various data feeds from light sensors.
- Provide interface /dashboards for generating alert and notifications in real time.
- Provide single dashboard of various brand of lighting solution.
- Support lighting control like diming, switch on/off, group control etc.
- Provide APIs to connect to ICCC Platform to enable device data to be collected and facilitate cross-domain use cases.
- Provide APIs information to aggregate the Smart Lighting services on ICCC.
- Support the following standards such as Web sockets, REST APIs and typical formats such as HTML, JSON etc. for integration with ICCC
- Expose information to enable ICCC Platform to project energy consumption graphs and implement policy on per-light control nodes.
- Event correlation and development of use-case / SoPs
- Configure thresholds, generate alert and trigger SOP
- Integration with GIS map
- Generate heat map.

- [Add more/Modify]

4.5 Operation and maintenance

Energy efficiency should be achieved by a comprehensive Operation & Maintenance of the overall system for a period of 5 Years from the date of go-live.

Following are the indicative activities the MSI shall perform during O&M period:

- Replacing defective lamps, accessories, and wires
- Rectification of cable faults, regular maintenance of service cabinet/fuse box.
- Regular cleaning of the luminaire covers to keep it free of dust/dirt and increase light output
- Regular maintenance of smart streetlight control system like LED controller, feeder panels etc.
- Regular updates and upgrades of the centralized software at ICCC.
- Provide reports on utilization and efficiency as per defined KPIs.
- Monitor the electrical load on each phase & each circuit in the panel & also maintain load balance equally on all the phases. The MSI shall never allow any circuit to be overloaded and highlight the areas with proper justification where load balancing is not possible
- Repair/replace any equipment/ accessory that gets damaged /stolen for any reasons whatsoever, in the specified time as per SLAs, at no extra cost to the Authority.
- Ensure Preventive maintenance of entire infrastructure once in a quarter and submit to Authority or its designated agency alongwith detailed finding and dependencies.
- In case of request for change in location of field equipment post the handover of the system, the same shall be borne by Authority at either a unit rate as per commercials or a mutually agreed cost after **XX number** of requests during the contract period.

Key performance indicators (KPIs) to be monitored under an SLA.

- Predict the Lumens level based on ambient light
- Set the Dynamic Lighting Policy based on predicted Lumen level to reduce the energy consumption of the Lights and thereby saving on the electricity cost for [CITY_NAME]
- Provide location/status of Street Lights, Control Street Lights status.
- Identify any abnormalities in the Light sensors and provide notifications to ICCC for proactive maintenance of the sensors before the sensor's breakdown.
- Percentage of households with authorized electrical service.
- Percentage of electrical connections covered through smart meters.
- Average number of electrical interruptions per year.

- Average length of electrical interruptions per year.
- Percentage of total energy derived from renewable sources.
- Energy consumption per unit - street lighting
- Percentage of new and redeveloped buildings following green building norms
- Total energy consumption per capita
- [Add other Baselineing and monitoring parameters]

Component 5- Public Address System

5.1 Overview

Authority has planned to install Public Address system (PAS) which shall be used at intersections, public places, marketplaces or identified strategic locations (City to provide details) as identified by Authority to make important announcements for the public, and if required, for an emergency evacuation.

It shall be able to broadcast messages across all PAS to be installed across the city or specific announcement could be made to a particular location.

5.2 Scope of work

The MSI shall install IP based Public Address System as part of the information dissemination system at [City to provide details] in the city. These systems shall be deployed at identified junction to make public interest announcements. The system deployed shall be IP based and have the capability to be managed and controlled from the ICCC. Minimum 2 loudspeakers should be used at each identified location for the announcements.

The Authority, in consultation with Traffic Police can propose alternate locations at the time of implementation, apart from the locations mentioned in the RFP, where their effectiveness in communicating information about traffic conditions in {CITY_NAME} will be maximized.

The MSI is expected to carry out field surveys to verify the status of physical installations, electricity availability, geographic area covered, and scope of the project defined so as to familiarize on the existing field conditions and the scope. The MSI shall also identify necessary legal / statutory clearances required for erecting and installing the required poles/ junction boxes etc.

The MSI is also required to provide a PA system management system to be integrated with the ICCC.

[add further scope as applicable]

5.2.1 Functional Requirements

Make: <to be provided by the bidder>

Model: <to be provided by the bidder>

#	Functional requirement	Bidder's Response (How functionality will be met)
i.	The system should have the capability to control individual PAS i.e. to make an announcement at select location (1:1) and all locations (1:	

	many) simultaneously. The PAS should also support both, Live and Recorded inputs.	
ii.	The system shall also deliver pre-recorded messages to the loudspeakers attached to them from CD/DVD Players & Pen drives for public announcements.	
iii.	It should provide remote- managed and supervised operation.	
iv.	It should allow easy to import, export, and save audio files to the hard drives /system as required.	
v.	Auto replay of playlist music after cut-in or emergency announcements should be possible.	
vi.	Audio-recording via microphone should be available.	
vii.	The system should provide access control mechanism at the ICCC to regulate the use through proper authorization.	
viii.	The PA system shall contain an IP-based announcing control connected to the ICCC.	
ix.	The PA system's master controller should have function keys for selecting the single location, group of locations, or all locations.	
x.	The system should have provision to store all the announcement for a minimum of 90 days.	
xi.	[Add more/Modify]	

5.2.2 Technical requirement

[The Authority may include the component specific technical requirement here which are vendor/ technology agnostic]

S.No.	Technical requirement	Bidder response (How the functionality will be met?)
1		
..n		

5.2.3 Physical/Civil requirement

The MSI shall be responsible for carrying out all the civil work required for setting PA system infrastructure including, but not limited to:

- a) Survey, location finalization in coordination/ approval from Authority.
- b) The MSI shall consider for lateral clearance as well as a vertical clearance height as per Public Works Departments/ road repair division following IRC NHAI (National Highway Authority of India) guidelines.
- c) Preparation of concrete foundation for PA system poles.
- d) Hard/soft soil deep digging and backfilling after cabling.
- e) Install Pole of required size and specifications at identified locations
- f) Chambers with metal cover at every junction box, pole and at road crossings.
- g) Installation of field level components of the PA system
- h) Coordination with relevant authorities for permission to erect poles and other infrastructure. No commercial/legal fees (except the RoW charges) shall be applicable to Authority for obtaining the necessary permissions.
- i) To ensure all the equipment's installed in the outdoor locations are vandal proof.
- j) In case the equipment/sensors get damaged /stolen for reasons whatsoever, it shall repair/replace the same in the specified time as per SLAs at no extra cost to the Authority.

5.2.4 Electrical requirements

MSI shall provision for electricity connection to the PA system through an aggregation point. Since this component has dependency on approval from local authorities, it is recommended that MSI plans this requirement well in advance & submits the application to the concerned electricity distribution agency with requisite fees, as applicable.

MSI shall carry out the electrical work required for powering all the components of PA system.

MSI shall ensure that all the Electrical installations, fixtures, and wirings/cables shall conform to the Indian electrical codes standard, Bureau of Energy Efficiency (BEE).

5.2.5 Network Connectivity requirements

Please refer RFP Volume II Section 1 for relevant details regarding network connectivity.

5.3 Bill of Material

S.No.	Description	Unit	Quantity
I.	Supply of Public Address System (PAS) of (<Size>)		
II.	Provisioning of the network connectivity at identified locations.		

III.	Supply of IT infrastructure (Hardware/Software/middleware) including data security		
IV.	Physical/Civil work		
V.	Provision of Electrical connections		
VI.	Installation, Testing and Commissioning Charges		
VII.	Integration with ICCC system (Specify the integration requirements)		
VIII.	UAT and handover charges		
IX.	Operation and Maintenance (O&M) for 5 years		

Note 1: Add rows above if required, as per number of items

Note 2: The items to be quotes as per the functional requirement given in Section 5.2.1 above.

5.4 ICCC Integration requirements

Minimum integration requirements shall be:

- Aggregate various data feeds from PA system.
- Provide interface /dashboards for generating alert and notifications in real time.
- The PA solution should provide APIs to connect to ICCC Platform to enable device data to be collected and facilitates cross-domain use cases.
- Provide APIs information to aggregate the services on ICCC. The Solution should support the following standards such as Web sockets, REST APIs and typical formats like HTML, JSON etc. to have integration with ICCC
- Event correlation and development of use-case / SoPs
- Configure thresholds, generate alert and trigger SOP
- Integration with GIS map
- [Add more/Modify]

5.5 Operation and maintenance

The MSI is required to provide comprehensive Operation & Maintenance of the overall system for a period of 5 Years from the date of go-live. Following are the indicative activities the MSI shall perform during O&M period:

- Repair/replace any equipment/ accessory that gets damaged /stolen for any reasons whatsoever, in the specified time as per SLAs, at no extra cost to the Authority.
- Regular cleaning of the filed components to keep it free of dust/dirt.
- Regular updates and upgrades of the centralized software at ICCC.
- Provide reports on utilization and efficiency as per defined KPIs.
- Ensure Preventive maintenance of entire infrastructure once in a quarter and submit to Authority or its designated agency along with detailed finding and dependencies.
- During implementation, if observed that any field infrastructure requires change in the location, it shall be done by MSI without any extra cost as long as it does not exceed X% during the agreement period.
- In case of request for change in location of field equipment post the handover of the system, the same shall be borne by Authority at either a unit rate as per commercials or a mutually agreed cost after XX number of requests during the contract period.

Key performance indicators (KPIs) to be monitored under an SLA.

- Provide location/status of PA system on ICCC dashboard
- Identify any abnormalities and provide notifications to ICCC for proactive maintenance
- Utilization reports location wise
- [Add other Baselineing and monitoring parameters]

Component 6- Variable Message Displays (VMDs)

6.1 Overview

Authority has planned to install digital road sign board viz. Variable Message Displays (VMDs) in {CITY_NAME} to inform the motorists of congestion, incidents ahead, unexpected delays and guide on main roads, expressways and arterial roads of cities by displaying route /rerouting information, warnings (accidents, congestions), and special information depending on the traffic situation.

6.2 Scope of work

The VMD shall communicate information & guidance about traffic, diversions, environment sensors, parking etc. to the citizens / public on the road. They shall also be used for showing emergency / disaster related messages as and when required.

The VMD shall communicate with ICCC using GSM Data/ Wi-Fi/ Ethernet/SMS Channel. GSM data channel (GPRS) / Wi-Fi / Ethernet shall be used to send online messages and SMS channel shall be used to send configuration packets to configure the SIM. Ethernet ports shall also be extended to ground level using necessary cables for local troubleshooting. Each unit shall be provided with a unique identification number and shall communicate with the ICCC.

VMD shall be managed and operated from the ICCC where information in the form of data messages shall be fed in a manner to be displayed on a specific VMD installed at a particular location or across all locations.

The location for VMDs will be provided to the MSI at no extra cost. Also, no rental/lease charges will be levied on the bidder for using the land for VMD.

The MSI shall describe in detail the design, operational and physical requirements of the proposed VMDs to demonstrate compliance with all the specified requirements in this RFP.

VMD shall be installed at identified strategic locations [City to provide details].

6.2.1 Functional Requirements

Make: <to be provided by the bidder>

Model: <to be provided by the bidder>

#	Functional requirement	Bidder's Response (How functionality will be met)
a)	Variable Message Display board	

i.	The system should be capable of displaying warnings, traffic advice, route guidance and emergency messages to motorists from the ICCC in real time.	
ii.	The VMD should have a functionality to display text and graphic messages.	
iii.	The System should be able to display failure status of any LED at ICCC.	
iv.	VMD application in ICCC should continuously monitor the operation of the VMD via the provided communication network.	
v.	Operating status of the VMDs should be checked periodically from the ICCC.	
vi.	The system shall be capable of setting an individual VMD or group of VMD's to display either one of the preset messages or customized one from the ICCC.	
vii.	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.	
viii.	A sequence of a minimum of ...(nos) messages/pictures/ pre-decided sign or group of signs shall be possible to assign for individual VMD or group of VMD's.	
ix.	It shall also store information about the time log of messages 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.	
x.	The ICCC shall perform regular tests (pre-set basis) for each individual VMD. Data communication shall be provided with sufficient security checks to avoid unauthorized access.	
xi.	The VMD shall be viewable and readable from a distance upto 150 mtrs. and various angles on the road as decided by the Authority	
xii.	All VMD shall be connected/configured to ICCC for remote monitoring through a communication network for two-way communication between VMD and ICCC to check system failure, power failure & link breakage.	

xiii.	Remote Diagnostics should allow identifying failure up to the level of failed individual display segment of the VMD.	
b)	VMD application: The central control software for VMD at ICCC should have capability to;	
i.	Allow controlling of multiple VMD from one console.	
ii.	Display all types of Message/ advertisement having alphanumeric character in English, Local language and combination of text with pictograms signs. The system should have features to manage video / still content for VMD.	
iii.	Divide VMD screens into multi-parts to display diverse forms of information like video, text, still images, advertisements, weather info, city info etc.	
iv.	Provide airtime management and billing system for paid content management.	
v.	Control and display messages on VMD boards as individual as well as groups. The playlist should be editable on the fly. The playlist should be applicable to one VMD or all VMD at one go. i.e. one should not individually upload playlist on all VMD.	
vi.	control and display multiple font types with flexible size and picture sizes suitable as per the size of the VMD.	
vii.	control brightness & contrast through software. Also depending upon day light. More bright during day and less during night.	
viii.	continuously monitor the operation of VMD board, implement control commands and communicated information to the ICCC via communication network.	
ix.	Provide Real-time log facility – log file documenting the actual sequence of display to be available at the ICCC	
x.	Provide Multilevel event log with time & date stamp.	
xi.	Provide Access to the system only after the authentication and acceptance of authentication based on hardware dongle with its log.	
xii.	Provide Location of each VMD plotted on GIS Map with their functioning status, which can be automatically updated.	

xiii.	Provide 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.	
xiv.	Provide Configurable scheduler on date/day of week basis for transmitting pre-programmed messages to any VMD.	
xv.	Provide role-based access to authorized users through single sign on different roles which could be defined (to be finalized at the stage of SRS) could be Administrator, Supervisor, Officer, Operator, etc. Rights to different modules / Sub-Modules / Functionalities should be role based and proper log report should be maintained by the system for such access	
xvi.	Apart from role-based access, the system should also be able to define access based on location.	
xvii.	To take care of remote failure, the systems need to be configured to mask and recover with minimum outage.	
xviii.	Provide an end-to-end security model that protects data and the 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. Such attacks and theft shall be controlled and well supported (and implemented) as per cyber security model framework specified in Para 9 of the Volume II Section-1	
xix.	Provide Ease of configuration, ongoing health monitoring, and failure detection, scalability, availability, and security to match the growth of the environment.	
xx.	Provide Facility to export reports to excel and PDF formats.	
xxi.	There should be enterprise (site wide) license for the software, so that any further increase in VMD should not attract more charge	
xxii.	[Add more/Modify]	

6.2.2 Technical requirement

[The Authority may include the component specific technical requirement here which are vendor/ technology agnostic]

[INDICATIVE ONLY]

#	Parameter	Minimum Specifications	Bidder's Response (How functionality will be met)
1.	Dimensions		
a.	Minimum XX length x YY height (As per need)		
2.	Color LED	Full Color, class designation C2 as per IRC/EN 12966 standard	
3.	Luminance Class/Ratio	L3 as per IRC/EN 12966 standards.	
4.	Luminance Control & auto Diming		
a.	Should be automatically provide different luminance levels but shall also be controllable from the traffic center using software.		
b.	Auto dimming capability to adjust to ambient light level (sensor based automatic control)		
c.	Photoelectric sensor shall be positioned at the sign front and sign rear to measure ambient light. Capable of being continually exposed to direct sunlight without impairment of performance.		
5.	Contrast Ratio	R3 as per IRC/EN 12966 standard	
6.	Beam Width	B6+ as per IRC/EN12966 standards.	
7.	Pixel Pitch	12mm or better	
8.	Picture Display		
a.	Capable of displaying real time message generated by ICCC.		
b.	Special frontal design to avoid reflection.		
c.	Display shall be UV resistant		
d.	At least 300mm as per IRC /EN 12966 standards		
e.	Full Matrix: Number of lines & characters adjustable, Full Active area for the entire VMD		
f.	Synchronized Dot to Dot display.		
9.	Viewing Angle	B6+ as per IRC/EN12966 standard- Viewing angle shall ensure message	

		readability for motorists in all lanes of the approach road	
10.	Viewing Distance	Suitable for readability from 150 Mtrs. or more at the character size of 240mm, from moving vehicles.	
11.	Self-Test		
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 sign even when diodes are not illuminated.		
c.	All periodic self-test results shall be relayed to the ICCC in real time to update the status of the VMS		
12.	Alarms		
a.	Door Open sensor to Inform Control room during unauthorized access		
b.	LED Pixel failure detection alarm		
13.	Flicker	Refresh Frequency should not be less 90 Hz. No visible flicker to naked eye.	
14.	Multiple Data Communication interface/Port	RJ45 Ethernet/GSM/Equivalent compatible with city level connectivity to ICCC	
15.	Communication (connectivity)	Wired & GPRS based wireless technology with 3G upgradable to 4G capability.	
16.	Ambient Operating Temperature	As per Ambience conditions under all weather situations	
17.	Humidity (RH)	As per Ambience conditions under all weather situations.	
18.	Protection against Pollution/dust/water	Complete VMS should be of IP 65 protection level from front and IP54 from side and rear. As per EN60529 or equivalent Standard.	
19.	Power		
a.	170-250V AC (more than 90% power factor) or DC as per equipment requirement.		

b.	Protection for overvoltage/ fluctuation/drop of the nominal voltage (50%) shall be incorporated.		
c.	The enclosure shall contain at least two 15 Amp VAC (industrial grade) outlet socket for maintenance purpose.		
20.	Power Back-up & its enclosure	UPS for one-hour power back-up with auto switching facility. The enclosure of UPS and battery should be pole mountable with IP 65 protected housing and lockable.	
21.	Material for VMS frame	at least 2mm aluminium or Non-corrosive, water resistant or better. Frame of the VMS should be black & Powder coated.	
22.	Mounting, Installation and finishes		
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 VMS sign 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 aluminum 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.		
23.	Wind Load	WL9 as per EN12966 to withstand high wind speeds and its own load.	
24.	Cabling, connections and Labelling.		
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 VMS.		
f.	The successful bidder has to provide safety certificate from qualified Electrical engineers approved/certified by Govt. Agency.		
26.	Local Storage in VMD	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 structure/timings, in case of connectivity failure.	

6.2.3 Physical/Civil requirement

The MSI shall be responsible for carrying out all the civil work required for setting VMD infrastructure including, but not limited to:

- a) Survey, location finalization in coordination/ approval from Authority.
- b) The MSI shall consider for lateral clearance as well as a vertical clearance height as per Public Works Departments/ road repair division following IRC NHAI (National Highway Authority of India) guidelines.
- c) Preparation of concrete foundation for VMD Gantry/Pole.
- d) Hard/soft soil deep digging and backfilling after cabling.
- e) Erect Gantry/Pole (of required size and specifications) with spans, at various locations (single lane road, double lane road) for installing VMDs.
- f) Chambers with metal cover at every junction box, gantry/pole and at road crossings.
- g) Coordination with relevant authorities for permission to erect gantry/poles and other infrastructure. No commercial/legal fees (except the RoW charges) shall be applicable to Authority for obtaining the necessary permissions.
- h) To ensure all the components installed in the outdoor locations are vandal proof.
- i) In case the equipment/sensors get damaged /stolen for reasons whatsoever, it shall repair/replace the same in the specified time as per SLAs at no extra cost to the Authority.

6.2.4 Electrical requirements

- a) MSI shall provision for electricity connection to the VMDs through an aggregation point. Since this component has dependency on approval from local authorities, it is recommended that MSI plans this requirement well in advance & submits the application to the concerned electricity distribution agency with requisite fees, as applicable.
- b) MSI shall carry out the electrical work required for powering all the components of VMD system.
- c) Electrical installation and wiring shall conform to the electrical codes of India.
- d) The electricity meters, if any, should be placed inside a power cabinet.

6.2.5 Network Connectivity requirements

Please refer RFP Volume II Section 1 for relevant details regarding network connectivity. The network connectivity can be through OFC Network or through 3G/4G SIM cards. All cost related to SIM card based connectivity shall be borne by the MSI.

6.3 Bill of Material

#	Description	Unit	Quantity
i.	Supply of Variable message Display (VMD) of (<Size>)		
ii.	Provisioning of the network connectivity at identified locations		
iii.	VMD enterprise-wide centralized software		
iv.	Physical/Civil work		
v.	Provision of Electrical connections to the VMD		
vi.	Installation, Testing and Commissioning Charges		
vii.	UAT and handover charges		
viii.	Integration with ICCC system (Specify the integration requirements)		
ix.	Operation and Maintenance (O&M) for 5 years		

Note 1: Add rows above if required, as per number of items

Note 2: The items to be quotes as per the functional requirement given in Section 6.2.1 above.

6.4 ICCC Integration requirements

Minimum integration requirements shall be

- Aggregate various data feeds from VMDs installed across locations.

- Provide interface /dashboards for generating alert and notifications in real time.
- Provide single dashboard of various brand of VMDs.
- The VMD solution should provide APIs to connect to ICCC Platform to enable device data to be collected and facilitates cross-domain use cases.
- Provide APIs information to aggregate the services on ICCC. The Solution should support the following standards such as Web sockets, REST APIs and typical formats like HTML, JSON etc. to have integration with ICCC
- Event correlation and development of use-case / SoPs
- Configure thresholds, generate alert and trigger SOP
- Integration with GIS map

6.5 Operation and maintenance

Provide a comprehensive Operation & Maintenance of the overall system for a period of 5 Years from the date of go-live. Following are the indicative activities the MSI shall perform during O&M period:

- Repair/replace any equipment/ accessory that gets damaged /stolen for any reasons whatsoever, in the specified time as per SLAs, at no extra cost to the Authority.
- Regular cleaning of the field level infrastructure to keep it free of dust/dirt
- Regular maintenance, updates and upgrades of VMD central software at ICCC.
- Provide reports on utilization and efficiency as per defined KPIs.
- Ensure Preventive maintenance of entire infrastructure once in a quarter and submit to Authority or its designated agency alongwith detailed finding and dependencies. The Key activities, including cleaning of equipment's/components under preventive maintenance shall be specified by the MSI in his technical bid.
- During implementation, if observed that any VMD requires change in the field of view / orientation, it shall be done by MSI without any extra cost as long as it does not exceed X% during contract period.
- In case of request for change in location of field equipment post the handover of the system, the same shall be borne by Authority at either a unit rate as per commercials or a mutually agreed cost after XX number of requests during the contract period.

Key performance indicators (KPIs) to be monitored under an SLA:

- Provide location/status of VMD system on ICCC dashboard
- Identify any abnormalities and provide notifications to ICCC for proactive maintenance
- Utilization reports location wise

- [Add other Baseline and monitoring parameters]

Component 7- Environmental Sensors

7.1 Overview

Environmental pollution, particularly of the air, is nowadays a major problem that unknowingly affects lives in the cities. As clear focus of building {CITY_NAME} as one of the finest example of SMART city, Authority believes it is important that citizens know of the air that they breathe.

Authority has planned to install Environmental sensors in {CITY_NAME} to inform the issues and level of pollution in the city w.r.t to Air quality sensors installed at strategic locations prescribed by CPCB and SPCB norms and standards on difference location across the city. The Authority is expected to install multiple environmental sensors across the city, to measure ambient conditions such as light intensity, temperature, water level (for chronic flood spots), air pollution, noise pollution and humidity.

7.2 Scope of work

The environment sensors shall be installed to display environment related information at various strategic locations through variable message display (VMD) system. It will integrate with the ICCC to capture and display/ provide feed on Temperature, Humidity, Pollutants like So[X], No[X], Co[X], PM2.5, PM10, Noise Pollution, etc. The data it collects should be location-marked.

It shall sense the prevailing environment conditions and send the data to the ICCC where real time data resides and the same shall be made available to various other departments and applications for decision making. This information shall be relayed instantaneously to signage – large, clear, digital-display screens which let citizens know regarding the prevalent environmental conditions.

The recorded data shall be used by Smart Environment Mobile applications to enable users for alarm management and notification of environmental details on real time basis.

These sensors shall be deployed on any of the existing or new CCTV Pole, Cantilever, and Gantry etc

7.2.1 Functional Requirements

Make: <to be provided by the bidder>

Model: <to be provided by the bidder>

#	Functional requirement	Bidder's Response (How functionality will be met)
a)	Environmental monitoring system	
ii.	Environmental Sensors should be ruggedized to be deployed in open air areas on streets and park.	

iii.	<p>MSI should ensure that smart city ICCC should be able to read and report at least the following Environmental parameters such as :</p> <ul style="list-style-type: none"> ○ Temperature, Humidity, Precipitation. ○ Ambient Light, Sound ○ CO, NO2 and SO2 ○ Particulate matter (PM 2.5 & PM 10) ○ Noxious gases ○ [Add/Modify] 	
iv.	<p>Environmental sensors should be able to communicate its data using wireless technology.</p>	
v.	<p>Environmental data should be collected in a software platform that allows third party software applications to read that data.</p>	
vi.	<p>The Environment sensor management platform should allow the configuration of the sensor to the network and also location details with latitude longitude junctions etc.</p>	
vii.	<p>Air Quality Parameters monitoring as per NAQI standard /CPCB Benchmarks: Measurement component & Range</p> <ul style="list-style-type: none"> ○ NO2 upto 10ppm ○ CO upto 1000 ppm ○ SO2 upto 20 ppm ○ O3 upto 1000 ppb ○ PM 2.5 0 to 230 micro gms / cu.m ○ PM 10 0 to 450 micro gms / cu.m ○ Weather Parameters ○ Temperature 0 to 100 Deg. C ○ Relative Humidity upto 100% ○ Light upto 10,000 Lux ○ UV upto 15 mW/ cm2 ○ CO2 upto 5000 ppm ○ Noise upto 120 dBA <p>Temperature and Humidity Monitoring Sensors</p>	

	<p>Rain Water Measurement: Rainfall in millimeters (mm)</p> <p>Water levels (for flood monitoring): Data integration with existing system (APIs will be provided)</p>	
viii.	<p>Ensure compliance of published Environmental standards/benchmarks and parameters set by:</p> <ul style="list-style-type: none"> ○ National Air Quality Index (NAQI) ○ Central Pollution Control Board (CPCB) or State pollution control board (SPCB) ○ Meteorological department. ○ Health department /Public health. ○ Pollution control boards and Environmental/Air quality, City health, E-Governance standards, frameworks, policies and guidelines available on http://egovstandards.gov.in (updated from time-to-time) 	
ix.	The environmental monitoring system should be capable of integration from the ICCC in real time.	
x.	The environmental systems should have a functionality to display units levels in real time sensors.	
xi.	The System should be able to display failure status of any sensors at ICCC.	
xii.	Environmental application in ICCC should continuously monitor the pollution levels and AQI index operation of the Sensors locations via the provided communication network.	
xiii.	Operating status of the environmental sensors levels should be checked periodically from the ICCC.	
xiv.	The Environmental monitoring system shall be capable of setting an individual sensor or group of sensors to display either one of the preset messages or customized one from the ICCC.	
xv.	MSI shall also ensure store Environment related Data & information in real time status of all the monitoring of Environmental sensors displayed/installed in the smart city locations.	
xvi.	The ICCC shall perform regular tests (pre-set basis) for each individual environmental sensor. Data communication shall be	

	provided with sufficient security checks to avoid unauthorized access.	
xvii.	The AQI index and pollutant Levels/benchmarking shall be viewable and readable from a distance upto 150 meters. and various angles on the junctions installed or road as decided by the Authority	
xviii.	MSI shall ensure the Environment monitoring systems devices/sensors shall be connected/configured to ICCC platform/dashboard for remote monitoring by establishing a communication network between Environmental sensors and Environmental monitoring platform at ICCC to check system failure, power failure & link breakage.	
xix.	Remote Diagnostics on real time basis of Environmental sensors and devices should allow identifying failure up to the level of failed individual display segment .	

7.2.2 Technical requirement

[The Authority may include the component specific technical requirement here which are vendor/ technology agnostic]

S.No.	Technical requirement	Bidder response (How the functionality will be met?)
1		
..n		

7.2.3 Physical/Civil requirement

MSI shall be responsible for carrying out all the civil work required for setting up all the field components of the Environmental monitoring system including:

- Installation works of Environmental Monitoring sensors
- Pole civil works foundation and erection of pole
- Environmental sensors type installation
- Fixtures of Environmental sensors
- Environmental Sensor Boxes /Cabinets placement
- Power cabinet / Batteries or Solar powered panels
- Installation & fixing Sensors/devices

MSI shall ensure all the Environmental sensors & devices /Boxes equipment's installed in the outdoor locations are vandal proof and in case the equipment/sensors get damaged /stolen for reasons whatsoever, it shall repair/replace the same in the specified time as per SLAs at no extra cost to the Authority.

7.2.4 Electrical requirements

- MSI shall provide electricity to the environmental sensors through an aggregation point. Since this component has dependency on approval from local authorities, it is recommended that MSI plans this requirement well in advance & submits the application to the concerned electricity distribution agency with requisite fees, as applicable.
- MSI shall carry out all the electrical work required for powering all the components of the Environmental monitoring systems.
- Electrical installation and wiring shall conform to the electrical codes of India.
- The electricity meters, if any, should be placed inside a power cabinet.

7.2.5 Network Connectivity requirements

Please refer RFP Volume II Section 1 for relevant details regarding network connectivity. The network connectivity can be through OFC Network or through 3G/4G SIM cards. All cost related to SIM card based connectivity shall be borne by the MSI.

7.3 Bill of Material

#	Description	Unit	Quantity
i.	Supply of Environmental sensors required of <size>		
ii.	Provisioning of the network connectivity to sensors at installed locations.		
iii.	Supply of types of Sensors & related IT infrastructure(Hardware/Software/middleware) including data security.		
iv.	Physical/Civil work		
v.	Provision of Electrical connections to devices/sensors.		
vi.	Installation, Testing and Commissioning Charges		
vii.	Integration with ICCC system (Specify the integration requirements)		
viii.	UAT and handover charges		
ix.	Operation and Maintenance (O&M) for 5 years		

Note 1: Add rows above if required, as per number of items

Note 2: The items to be quotes as per the functional requirement given in Section 7.2.1

7.4 ICCC Integration requirements

The data should be collected in a software platform that allows third party software applications to read that data. Various environment sensors shall sense the prevailing environment conditions and send the data to the integrated control system where real time data resides and the same shall be made available to various other departments and applications for decision making.

The sensor management platform should allow the configuration of the sensor to the network and also location details etc.

All Environment sensors related Data integration with existing system is to be ensured by MSI for all type of monitoring systems (APIs will be provided).

7.5 Operation and maintenance

- Provide a comprehensive Operation & Maintenance of the overall system for a period of 5 Years from the date of go-live. Following are the indicative activities the MSI shall perform during O&M period:
- Preventive maintenance shall be carried out once in a quarter along with corrective maintenance and also when calls are placed by Authority or its designated agency.
- Key activities, including cleaning of equipment's/components under preventive maintenance shall be specified by the MSI in his technical bid.
- During implementation, if observed that any sensor requires change in the field of view/orientation, it shall be done by MSI without any extra cost as long as it does not exceed X% during contract period.
- In case of request for change in location of field equipment post the handover of the system, the same shall be borne by Authority at either a unit rate as per commercials or a mutually agreed cost after XX number of requests during the contract period.

Key performance indicators (KPIs) to be monitored under an SLA.

- Provide location/status and operational status.
- Identify any abnormalities and provide notifications to ICCC for proactive
- [Add other Baselineing and monitoring parameters]

Component 8- Camera System

8.1 Overview

The Authority, in consultation with city Police plans to install IP based camera system at strategic junction/locations to provide safety and security to the citizens. The cameras shall be managed and controlled from the ICCC. Various types of cameras shall be provided by the authority as per the need for coverage and location.

8.2 Scope of work

A total nos. of(nos) Cameras of different types shall be installed at strategically locations [City to provide details] in the city within vicinity of constant Police supervision to avoid-misuse & vandalism.

The MSI shall install these cameras in consultation with Authority. The Cameras being the core of the entire Surveillance system, it is important that their selection is carefully done to ensure suitability & accuracy of the information captured on the field and is rugged, durable & compact.

These cameras shall work on 24 X 7 basis and transmit quality video feeds to the ICCC and capture the video feeds at [...] FPS for majority of the time and at [...] FPS for the lean period.

The authority/ Police Department may 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.

The MSI shall carry out field surveys to verify the status of physical installations, electricity availability, geographic area covered, and scope of the project defined so as to familiarize on the existing field conditions and the scope. The MSI shall also identify necessary legal / statutory clearances required for erecting and installing the required poles/ junction boxes etc.

The MSI is also required to provide a Video management system to be integrated with the ICCC.

The Authority may propose alternate locations at the time of implementation, apart from the locations mentioned in the RFP, where their effectiveness in communicating information about security and traffic conditions in {CITY_NAME} will be maximized.

8.2.1 Functional Requirements

8.2.1.1 Fixed/PTZ camera

8.2.1.2 The Cameras shall meet following functional Performance.

#	Type of Camera	Description	Day			Night		
			Detection of Object/	Recognition of Object/	Identification of Object/P	Detection of Object/	Recognition of Object/	Identification of Object/Per

			Person (Mrs)	Person (Mrs)	erson (Mrs)	Person(Mrs)	Person (Mrs)	son (Mrs)
i	Fixed	Live Video	50 m	30 m	20 m	50 m	30 m	20 m
ii	Fixed	Recorded Video (On digital Zoom)	50 m	30 m	20 m	50 m	30 m	20 m
iii	PTZ	Live video - (Zoom Out)	50 m	30 m	20 m	50 m	30 m	20 m
iv	PTZ	Recorded Video Zoom Out using Digital Zoom	50 m	30 m	20 m	50 m	30 m	20 m
v	PTZ	Live video (Zoom In)	200 m	150 m	100 m	200 m	150 m	100 m
vi	PTZ	Recorded Video Zoom In using Digital Zoom	200 m	150 m	100 m	200 m	150 m	100 m

Note:1. Above parameters are indicative. It may vary for different city requirement.

Note 2. MSI has to ensure proper Height of the camera, Angle of Camera, Distance of Target, Lux level, Lens size, Make of Lens, etc. functionality to achieve above results.

8.2.1.3 Automatic Number Plate Recognition System (ANPR)

Day Time

#	Location Name	Time Duration	Total Vehicle Passed	Number Plate captured in Software	Correct Number plate captured in	Accuracy		
						Number plate captured in	Correct Number plate Identified	Correct Number plate identified

					Software	Software / Total Vehicle Passed	/ Total Number plate Captured	/ Total Vehicles pass
i.		5 Minutes						
ii.		5 Minutes						
iii.		5 Minutes						
Required Accuracy								>= 90%

Night Time

#	Location Name	Time Duration	Total Vehicle Passed	Number Plate captured in Software	Correct Number plate captured in Software	Accuracy		
						Number plate captured in Software / Total Vehicle Passed	Correct Number plate Identified / Total Number plate Captured	Correct Number plate identified / Total Vehicles pass
i.		5 Minutes						
ii.		5 Minutes						
iii.		5 Minutes						
Required Accuracy								>= 70%

Note: 1. MSI to ensure proper Height of the camera, Angle of Camera, Distance of Target, Lux level, Lens size, Make of Lens, etc. functionality to achieve above results.

2. MSI to ensure above results in 4 wheelers as well as 2 wheelers.

3. MSI to ensure above results at the speed of more than 150 km/h

8.2.1.4 RLVD system (for E-challan)

#	Duration	No. of Violation detected in system(A)	No. of Number plate detected by system for violation(B)	No. of correct Number plate identified by system(C)	Accuracy (C)/(A)
i.	30 Minutes (Day)				
ii.	30 Minutes (Noon)				

iii.	30 Minutes (Evening)				
iv.	30 Minutes (Night)				
Expected Accuracy					>=90%

- MSI to ensure proper Height of the camera, Angle of Camera, Distance of Target, Lux level, Lens size, Make of Lens, etc. functionality to achieve above results.
- MSI to to ensure above results in 4 wheelers as well as 2 wheelers.
- MSI must keep the track record of Challan issued for past 2 years.
- E-challan system shall be able to retrieve vehicle owners Details and vehicle data from RTO database to minimize data entry.

8.2.1.5 Over speed detection system (For e-Challan)

#	Duration	No. of Violation detected in system(A)	No. of Number plate detected by system for violation (B)	No. of correct Number plate identified by system (C)	Accuracy (C)/(A)
i.	30 Minutes (Day)				
ii.	30 Minutes (Noon)				
iii.	30 Minutes (Evening)				
iv.	30 Minutes (Night)				
Expected Accuracy					>=90%

- MSI to ensure proper Height of the camera, Angle of Camera, Distance of Target, Lux level, Lens size, Make of Lens, appropriate WDR, BLC, HLC etc. functionality to achieve above results.
- MSI to to ensure above results in 4 wheelers as well as 2 wheelers.
- MSI to must keep the track record of Challan issued for past 2 years.
- E-challan system shall be able to retrieve vehicle owners Details and vehicle data from RTO database to minimize data entry.

8.2.1.6 Technical Requirements -Fixed Camera

[The Authority may include the component specific technical requirement here which are vendor/technology agnostic]

S.No.	Technical requirement	Bidder response (How the functionality will be met?)
1		

..n		
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Make: <to be provided by the bidder>

Model: <to be provided by the bidder>

(INDICATIVE ONLY)

#	Parameter	Minimum Specifications or better
i.	Video Compression	H.265 or above
ii.	Video Resolution	1920 X 1080
iii.	Frame rate	25 FPS at all resolutions with Controllable Bit Rate/ Bandwidth and Frame Rate
iv.	Operating frequency	50 Hz
v.	Image Sensor	1/3" Progressive scan CMOS
vi.	Lens Type	Varifocal, C/CS Mount, IR Correction Full HD lens compatible to camera imager
vii.	Lens	5~50mm/ 8 – 40 mm, F1.4 IR corrected, P-Iris
viii.	Electronic Shutter	1 to 1 / 10,000 s or better
ix.	Multiple Streams	The camera shall be able to setup and stream out minimum three (3) stream profiles. Each stream profile can have its own compression resolution, frame rate and quality independently up to Full HD @ 25 FPS (minimum)
x.	Minimum Illumination	Color mode: 0.01 lux@F1.4; B/W mode: 0 lux (IR ON)
xi.	IR Cut Filter	Automatically Removable IR-cut filter
xii.	Day/Night Mode	Yes with IR Cut Filter.
xiii.	S/N Ratio	≥ 50 dB
xiv.	Auto adjustment + Remote Control of Image settings	Color, brightness, sharpness, contrast, white balance, exposure control, backlight compensation, Gain Control, Auto back focus
xv.	Wide Dynamic Range	True WDR 90 db or better
xvi.	Privacy Masks	Minimum 4
xvii.	Audio	Full duplex, line in and line out, G.711/ G.726

xxviii.	Local storage	microSDXC/SD up to 64 GB (Class 10) 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.
xix.	Protocol	IPv4, IPv6, IGMP, ICMP, ARP, TCP, UDP, DHCP, PPPoE, RTP, RTSP, RTCP, DNS, DDNS, NTP, FTP, UPnP, HTTP, HTTPS, SMTP, 802.1x, SNMP, ONVIF Profile S & preferably G
xx.	Security	Password Protection, IP Address filtering, User Access Log, HTTPS encryption, IEEE 802.1Xa network access control, Digest authentication, User access log
xxi.	Intelligent Video	Motion Detection & Tampering alert
xxii.	Alarm I/O	Minimum 1 Input & Output contact for 3rd part interface
xxiii.	Operating conditions	As per city Ambient conditions in all seasons
xxiv.	Interface	RJ 45, 100 Base TX
xxv.	Humidity	Humidity 10 95% RH (condensing)
xxvi.	Casing	NEMA 4X / IP-66 rated & IK 09 or higher
xxvii.	Certification	UL / EN, CE ,FCC
xxviii.	Power	802.3af PoE (Class 0) and 12VDC/24AC/ / POE+ IEEE 902.3at Compliant
xxix.	Physical security	Detection of camera tampering and Detection of Motion should be possible using either camera or VMS
xxx.	IR illuminator	IR Illuminator with range of 100 meters can be internal or external based upon requirement of site/focus/area of interest.

8.2.1.7 Technical Requirements -Camera with Edge analytics (INDICATIVE ONLY)

Make: <to be provided by the bidder>

Model: <to be provided by the bidder>

#	Parameter	Minimum Specifications or better
i.	Video Compression	H.265 or above
ii.	Video Resolution	1920 X 1080
iii.	Frame rate	25 FPS at all resolutions with Controllable Bit Rate/ Bandwidth and Frame Rate
iv.	Operating frequency	50 Hz
v.	Image Sensor	1/3" Progressive scan CMOS

vi.	Lens Type	Varifocal, C/CS Mount, IR Correction Full HD lens compatible to camera imager
vii.	Lens	5~50mm/ 8 – 40 mm, F1.4 IR corrected, P-Iris
viii.	Electronic Shutter	1 to 1 / 10,000 s or better
ix.	Multiple Streams	The camera shall be able to setup and stream out minimum three (3) stream profiles. Each stream profile can have its own compression resolution, frame rate and quality independently up to Full HD @ 25 FPS (minimum)
x.	Minimum Illumination	Color mode: 0.01 lux@F1.4; B/W mode: 0 lux (IR ON)
xi.	IR Cut Filter	Automatically Removable IR-cut filter
xii.	Day/Night Mode	Yes with IR Cut Filter.
xiii.	S/N Ratio	≥ 50 dB
xiv.	Auto adjustment + Remote Control of Image settings	Colour, brightness, sharpness, contrast, white balance, exposure control, backlight compensation, Gain Control, Auto back focus
xv.	Wide Dynamic Range	True WDR 90 db or better
xvi.	Privacy Masks	Minimum 4
xvii.	Audio	Full duplex, line in and line out, G.711/ G.726
xviii.	Local storage	microSDXC/SD up to 64 GB (Class 10) 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.
xix.	Protocol	IPv4, IPv6, IGMP, ICMP, ARP, TCP, UDP, DHCP, PPPoE, RTP, RTSP, RTCP, DNS, DDNS, NTP, FTP, UPnP, HTTP, HTTPS, SMTP, 802.1x, SNMP, ONVIF Profile S & preferably G
xx.	Security	Password Protection, IP Address filtering, User Access Log, HTTPS encryption, IEEE 802.1Xa network access control, Digest authentication, User access log
xxi.	Intelligent Video	Motion Detection & Tampering alert
xxii.	Alarm I/O	Minimum 1 Input & Output contact for 3rd part interface

xxiii.	Operating conditions	As per city Ambient conditions in all seasons
xxiv.	Interface	RJ 45, 100 Base TX
xxv.	Humidity	Humidity 10 95% RH (condensing)
xxvi.	Casing	NEMA 4X / IP-66 rated & IK 09 or higher
xxvii.	Certification	UL / EN, CE ,FCC
xxviii.	Power	802.3af PoE (Class 0) and 12VDC/24AC/ / POE+ IEEE 902.3at Compliant
xxix.	Physical security	Detection of camera tampering and Detection of Motion should be possible using either camera or VMS
xxx.	IR illuminator	IR Illuminator with range of 100 meters can be internal or external based upon the requirement of site/ focus/ are a of interest.
xxxi.	Edge Analytics	The camera should support the following analytics at edge level Face Detection, Intrusion Detection, Line Crossing Detection, Region Entrance Detection, Region Exiting Detection

8.2.1.8 Technical Requirements -PTZ Cameras (INDICATIVE ONLY)

Make: <to be provided by the bidder>

Model: <to be provided by the bidder>

#	Parameters	Functional requirements
i.	Video Compression	latest
ii.	Video Resolution	Min resolution of 1920 X 1080
iii.	Frame rate	Min. 25 frame per second
iv.	Image Sensor	1/3" OR 1/4" Progressive Scan CCD / CMOS
v.	Lens	Auto-focus, 4.3 - 129 mm (corresponding to 30x)

vi.	Minimum Illumination	Color mode: 0.01 lux@F1.4; B/W mode: 0 lux (IR ON)
vii.	Day/Night Mode	Colour, Mono, Auto
viii.	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
ix.	Protocol	IPv4, IPv6, IGMP, ICMP, ARP, TCP, UDP, DHCP, PPPoE, RTP, RTSP, RTCP, DNS, DDNS, NTP, FTP, UPnP, HTTP, HTTPS, SMTP, 802.1x, SNMP, ONVIF Profile S & preferably G Certified
x.	Security	Password Protection, IP Address filtering, User Access Log, HTTPS encryption
xi.	Casing	NEMA 4X / IP-66 rated, IK10 rated
xii.	Certification	UL/EN,CE,FCC,ONVIF
xiii.	Local storage	Minimum 64 GB. In the event of failure of connectivity to the central server the camera shall record video locally on the SD card automatically transfer to server once it is restored.
xiv.	IR	Internal/External. IR range should be 100 mtr or better
xv.	Operating Temperature	As per city Ambient conditions in all seasons

8.2.1.9 Technical Requirements - RLVD and SVD Camera (INDICATIVE ONLY)

Make: <to be provided by the bidder>

Model: <to be provided by the bidder>

#	Parameter	Minimum Specifications or better
i.	Video Compression	H.265 or above
ii.	Video Resolution	1920 X 1080

iii.	Frame rate	25 FPS at all resolutions with Controllable Bit Rate/ Bandwidth and Frame Rate
iv.	Operating frequency	50 Hz
v.	Image Sensor	1/3" Progressive scan CMOS
vi.	Lens Type	Varifocal, C/CS Mount, IR Correction Full HD lens compatible to camera imager
vii.	Lens	5~50mm/ 8 – 40 mm, F1.4 IR corrected, P-Iris
viii.	Electronic Shutter	1 to 1 / 10,000 s or better
ix.	Multiple Streams	The camera shall be able to setup and stream out minimum three (3) stream profiles. Each stream profile can have its own compression resolution, frame rate and quality independently up to Full HD @ 25 FPS (minimum)
x.	Minimum Illumination	Color mode: 0.01 lux@F1.4; B/W mode: 0 lux (IR ON)
xi.	IR Cut Filter	Automatically Removable IR-cut filter
xii.	Day/Night Mode	Yes with IR Cut Filter.
xiii.	S/N Ratio	≥ 50 dB
xiv.	Auto adjustment + Remote Control of Image settings	Colour, brightness, sharpness, contrast, white balance, exposure control, backlight compensation, Gain Control, Auto back focus
xv.	Wide Dynamic Range	True WDR 90 db or better
xvi.	Privacy Masks	Minimum 4
xvii.	Audio	Full duplex, line in and line out, G.711/ G.726

xxviii.	Local storage	microSDXC/SD up to 64 GB (Class 10) 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.
xix.	Protocol	IPv4, IPv6, IGMP, ICMP, ARP, TCP, UDP, DHCP, PPPoE, RTP, RTSP, RTCP, DNS, DDNS, NTP, FTP, UPnP, HTTP, HTTPS, SMTP, 802.1x, SNMP, ONVIF Profile S & preferably G Certified
xx.	Security	Password Protection, IP Address filtering, User Access Log, HTTPS encryption, IEEE 802.1Xa network access control, Digest authentication, User access log
xxi.	Intelligent Video	Motion Detection & Tampering alert
xxii.	Alarm I/O	Minimum 1 Input & Output contact for 3rd part interface
xxiii.	Operating conditions	As per city Ambient conditions in all seasons
xxiv.	Interface	RJ 45, 100 Base TX
xxv.	Humidity	Humidity 10 95% RH (condensing)
xxvi.	Casing	NEMA 4X / IP-66 rated & IK 09 or higher
xxvii.	Certification	UL / EN, CE,FCC
xviii.	Power	802.3af PoE (Class 0) and 12VDC/24AC/ / POE+ IEEE 902.3at Compliant
xxix.	Physical security	Detection of camera tampering and Detection of Motion should be possible using either camera or VMS
xxx.	IR illuminator	IR Illuminator with range of 100 meters can be internal or external based upon the requirement of site/ focus/ area of interest.

8.2.1.10 Technical Requirements -ANPR System (INDICATIVE ONLY)

Make: <to be provided by the bidder>

Model: <to be provided by the bidder>

#	Parameter	Minimum Requirements
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i.	General	The entire ANPR process shall be performed at the lane location in real-time. The information captured of the plate alphanumeric, date-time, and any other information is required shall be completed in [...] millisecond. This information shall be transmitted to ICCC for further processing if necessary, and/or stored at the lane for later retrieval.
ii.	Lane Coverage	Each camera system should cover at least 1 lane having width of 3.5 meter or more.
iii.	Detection Zone	15 m to 20 m
iv.	Maximum Vehicle Speed	Capture clear images of all vehicles moving at a speed up to 150 km/hr.
v.	Vehicle Detection and Video Capture Module	The System shall automatically detect the license plate of all the vehicles in the camera view in real time using video detection and activates license plate recognition software.
vi.	Optical Character Recognition	The system shall perform OCR (optical character recognition) of the license plate characters in real time. (English alpha-numeric characters in standard fonts). OCR accuracy shall be at least [90%] during daytime and [70%] during night time for standard plates. System is able to detect and recognize the English alphanumeric License plate in standard fonts and formats of all vehicles including cars, HCV, LCV and two wheelers. The system should be robust to variation in License Plates in terms of font, size, contrast and colour.
vii.	Network	Connectivity from site to control room shall be through proper network and local storage should be provided to account for any data loss.

viii.	Data capture and transfer	<p>The OCR data of all vehicles along with the JPEG image of the vehicle etc. shall be automatically transferred immediately to the nominated server in ICCC. Each vehicle record shall be a single file and shall contain, as a minimum, an ASCII header that contains the following:</p> <ul style="list-style-type: none"> a) vehicle registration number b) date and time that the vehicle is identified c) ANPR site location, and <p>It shall be possible to include one or more of the following in the same single vehicle record:</p> <ul style="list-style-type: none"> a) image of the number plate b) image of the front of the vehicle from the ANPR IR camera, and/or c) wide-angle vehicle/lane image (with additional scene camera). <p>A detailed description of the file format shall be finalized by the Authority to further develop post processing software.</p>
ix.	Hot List creation	<p>The system shall have option to input certain license plates according to hot listed categories like "Wanted", "Suspicious", "Stolen" etc. The system can generate automatic alarms to alert the ICCC personnel for further action, in the event of detection of any vehicle falling in the Hot listed categories.</p>
x.	Alert Generation	<p>On successful recognition of the number plate, system shall be able to generate automatic alarm to alert the control room for vehicles which have been marked as "Wanted", "Suspicious", "Stolen", etc.</p>
xi.	Data Storage	<p>The System shall store JPEG image of vehicle and license plate into a database management system like MySQL, PostgreSQL etc. along with date timestamp and site location details.</p>
xii.	Data Retrieval and Reports	<p>The system shall enable easy and quick retrieval of snapshots, video and other data for post incident analysis and investigations. Database search could be using criteria like date, time, location and vehicle number. The system shall be able to generate suitable MIS reports as desired by the user. The system shall also provide advanced and smart searching facility of License plates from the database.</p>
xiii.	Integration with Third Part VMS	<p>The system should be integrated with the proposed Video Management System.</p>

xiv.	Local Server at Intersection for ANPR Processing	The system must be able to run on Outdoor Industrial Grade server and should be able to cover at least 4 lanes or complete junction. The entire unit should be capable to perform under all weather conditions in the city. The System should be equipped with appropriate storage capacity for transactional data for min. [..] days, with overwriting capability. Images should be stored in tamper proof format only.
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8.2.1.11 Drones (INDICATIVE ONLY)

Make: <to be provided by the bidder>

Model: <to be provided by the bidder>

#	Parameter	Specification
i.	UAV Weight with battery and max. payload	Should be Light weight
ii.	Endurance	40 minutes
iii.	Range of live transmission (LOS)	>= 4 km (un-obstructed & interference free)
iv.	Typical Cruise Speed	>= 7 m/s
v.	Propulsion	Battery Powered Electric Propulsion
vi.	Maximum operating altitude (AGL)	>= 400m AGL (Above Ground Level)
vii.	Functional Temperature Range	As per Ambient conditions in all seasons
viii.	Maximum launch altitude (AMSL)	>= 3000m AMSL (Above Mean Sea Level)
ix.	Dust & Drizzle Resistance	IP53 rating
x.	Wind Resistance	Upto 10m/s (36kmph or ~20knots)
xi.	Technical Life of UAV	Minimum 500 landings
xii.	Launch & Recovery	Autonomous Vertical Take-Off & Landing (VTOL)
xiii.	Maximum space required for recovery	25m x 25m open area

xiv.	Autonomy	Fully autonomous from Take-off to Landing without using any R/C controller
xv.	Flight Modes	<ul style="list-style-type: none"> ○ Altitude Hold ○ Hover at a defined waypoint ○ Autonomous Waypoint Navigation (pre- defined as well as dynamically adjustable waypoints during flight) ○ Remotely Piloted mode for video-based navigation (RPV Mode) ○ Real-time Target Tracking of designated static and moving targets
xvi.	Packaging and Storage	Waterproof backpack that houses all the sub- systems which allows the complete system to be carried and operated on field by the crew, should have IP66 rating or better for dust and drizzle protection (Test results from any accredited Lab to be submitted)
xvii.	Failsafe features	<ul style="list-style-type: none"> ○ Auto-Return to Home and Land on Communication Failure ○ Auto-Return to Home and Land on Low Battery ○ Multiple GPS on-board for redundancy ○ Auto-Return to Home and Land on exceeding Wind limit of the system ○ Auto-Return to Home and Land on Battery Imbalance ○ Auto-Return to Home and Land on exceeding Temperature limit of the system
xviii.	Payload	<ul style="list-style-type: none"> ○ HD quality with min 10x optical zoom video payload, 3 axis gimbal
xix.	Video Stabilization	Electronic stabilization of video output at all zoom levels in real-time
xx.	Payload Control (in flight)	Pan: 360° continuous Tilt: 90°
xxi.	Target Detection Slant Range (Human Size Target)	Daylight: Minimum 800m Thermal: Minimum 400m
xxii.	Navigation Lights	Switchable

xxiii.	GUI Display parameters	<ul style="list-style-type: none"> ○ Geographic Map along with UAV location, UAV trajectory, camera view polygon, waypoints and flight plan ○ Real-time video from the UAV with on- screen display of important parameters like UAV co-ordinates, target (payload) co-ordinates and range from UAV, true North indication, Distance from HOME, etc. ○ Real-time video displayed at all times during the flight ○ Artificial Horizon indicating UAV attitude
xxiv.	Maps	<ul style="list-style-type: none"> ○ Capability of working with Google Maps and/or other available open-source maps. Application should have the capability to download maps automatically after specifying location GPS co-ordinates ○ Capability to integrate geo-referenced raster maps provided in at least one of the commonly used digital map formats (e.g. GIF TIFF)
xxv.	User Controls	<ul style="list-style-type: none"> ○ One-click Take-off/Land/Hover ○ Set altitude of the UAV ○ Waypoint navigation

8.2.2 Physical/Civil Requirements

MSI shall use industry leading practices w.r.t positioning and mounting the cameras, poles and junction boxes. Some of the check-points that need to be adhered to by the MSI while installing / commissioning cameras are as follows:

- **Surveillance objective:** Positioning the camera such that the required field of view is being captured as finalized in field survey.
- **Camera protection:** Ensuring protection of camera from weather, physical damage, animals and theft.
- **Best Image & video capturing:** proper adjustments, alignments orientation & inclination for ensuring high quality of capture with best results in video & capture.
- **Vibrations Resistance:** ensuring well placement of pole for resistance adhering to road safety norms.
- **Collusion prevention:** barriers around the junction box & pole foundation in case it's installed in collision prone place.
- **Branding & color coding:** poles and junction boxes, to warn mischief mongers against tampering with the equipment at the junction.

Civil work

MSI shall be responsible for carrying out all the civil work required for setting up all the field components of the system including:

- Preparation of concrete foundation for MS-Poles & cantilevers
- Laying of GI Pipes (B Class) complete with GI fitting
- Hard soil deep digging and backfilling after cabling
- Soft soil deep digging and backfilling after cabling
- Chambers with metal cover at every junction box, pole and at road crossings
- Concrete foundation from the Ground for outdoor racks

Installation of Poles/Cantilevers/Gantry

For installing the surveillance /cameras the MSI shall provide Cantilever/Gantry/Unipole (as required) with spans, at various locations (single lane road, double lane road).

Spans need to be specified depending on the number of lanes that need to be bridged. MSI shall consider additional space for lateral clearance as well as a vertical clearance height as per NHAI (National Highway Authority of India) guidelines.

In case any equipment/device get damaged /stolen for reasons whatsoever, MSI shall repair/replace the same in the specified time as per SLAs at no extra cost to the Authority.

8.2.3 Electrical Requirements

MSI shall provide electricity to the cameras through the aggregation point. Since this component has dependency on approval from local authorities, it is recommended that MSI plans this requirement well in advance & submits the application to the concerned electricity distribution agency with requisite fees, as applicable.

MSI shall carry out all the electrical work required for powering all the components of the system

Electrical installation and wiring shall conform to the electrical codes of India.

Surveillance junction box: MSI shall make provisions for providing electricity to the cameras (ANPR, PTZ, and Fixed) via SJB (Surveillance Junction Box), housing the UPS/SMPS power supply, with power backup as defined in this RFP.

Wired Box cameras: MSI shall provision for drawing power through PoE (Power over Ethernet), while PTZ cameras shall be powered through dedicated power cable laid separately along with STP/SFTP cable.

Electricity meters: MSI shall house the electricity meters inside the power cabinet as mentioned in the controller Cabinet section as above.

8.2.4 Network Connectivity requirements

Please refer RFP Volume II Section 1 for relevant details regarding network connectivity

MSI shall ensure that redundant, high quality, seamless connectivity is provided to all cameras across the city.

Description	PTZ camera	Fixed Box camera	ANPR Camera
Resolution (Pixels)	1920 x 1080	1920 x 1080	1920 x 1080
Frames per second (FPS)	25 FPS	25 FPS	50 FPS
<u>Viewing & storage</u>			
Normal Time	25 FPS	25 FPS	50 FPS
No Movement Period / Night Period	12 FPS	8 FPS	As required

- Connectivity to DC/DR and ICCC shall be provided with scalable capacities to allow for expansion in the future. MSI is required to undertake estimation of bandwidth & storage requirements as per the benchmark parameters.
- MSI shall provide adequate bandwidth for each camera to maintain high quality HD video transmission to the ICCC. The actual bandwidth requirement to cater to above mentioned bandwidth & storage parameters and to meet SLAs shall be estimated by the MSI and proposed in the technical bid with detailed calculations.
- MSI shall design the networking solution in such a manner that there is no single point of failures and solution meets all the uptime & and quality related SLAs.

8.3 Bill of Material

#	Description	Unit	Quantity
x.	Supply of Camera of required <type>		
xi.	Provisioning of the network connectivity at installed locations.		
xii.	Supply of related IT infrastructure (Hardware/Software/middleware) including data security.		
xiii.	Physical/Civil work		
xiv.	Provision of Electrical connections to devices/sensors.		
xv.	Installation, Testing and Commissioning Charges		
xvi.	Integration with ICCC system (Specify the integration requirements)		
xvii.	UAT and handover charges		
viii.	Operation and Maintenance (O&M) for 5 years		

Note 1: Add rows above if required, as per number of items

Note 2: The items to be quotes as per the functional requirement given in Section 8.2

8.4 ICCC Integration requirements

- The Video management (VMS) application shall be integrated with the ICCC via SDK/API. All events and alarms will be available in the ICCC as required based on the SDK/API integration.
- Alarm linking between VMS sub-systems shall be done at VMS sub-system level to, for example, call up relevant pictures to screens and move PTZ units to pre-set positions in response to alarm and activate video recordings, modifying recording parameters as necessary.

8.5 Operations & Maintenance

- Authority shall assist in obtaining all necessary go ahead, legal permissions, NOC (No Objection Certificate) from various departments to execute the project. MSI shall have to identify and obtain necessary legal / statutory clearances for erecting the poles and installing cameras for provisioning of the required power, etc. MSI shall provide & manage all necessary paperwork to pursue permission from respective authorities. No commercial/legal fees (except the RoW charges) shall be applicable to Authority for obtaining the necessary permissions. These shall be provisioned for by the MSI in their price bid.
- The MSI shall provide all material required for mounting of components for cameras and other field equipment.
- MSI shall also get comprehensive insurance from reputed insurance company for the project duration for all the equipment's / components installed.
- MSI shall ensure all the equipment's installed in the outdoor locations are vandal proof and in case the equipment's get damaged /stolen for reasons whatsoever, it shall repair/replace the same in the specified time as per SLAs at no extra cost to the Authority.
- Preventive maintenance shall be carried out once in a quarter along with corrective maintenance and also when calls are placed by Authority or its designated agency. The key activities, including cleaning of equipment's/components under preventive maintenance shall be specified by the MSI in his technical bid.
- During implementation, if observed that any cameras requires change in the field of view / orientation, it shall be done by MSI without any extra cost as long as it does not exceed **X%** during contract period.
- In case of request for change in location of field equipment post-handover. the same shall be borne by Authority at either a unit rate as per commercials or a mutually agreed cost after **XX number** of requests during the contract period.

The first part of the document discusses the importance of maintaining accurate records of all transactions. This includes not only sales and purchases but also any other financial activities that may occur. It is essential to have a clear and concise system in place to ensure that all data is properly recorded and easily accessible.

In addition, the document emphasizes the need for regular audits and reconciliations. By comparing the recorded transactions against the actual bank statements and other external records, any discrepancies can be identified and corrected promptly. This helps to maintain the integrity of the financial data and ensures that the books are balanced.

Furthermore, the document highlights the significance of proper documentation. All invoices, receipts, and other supporting documents should be kept in a secure and organized manner. This not only facilitates the audit process but also provides a clear trail of evidence in the event of any disputes or legal challenges.

Finally, the document stresses the importance of staying up-to-date with the latest accounting standards and regulations. The financial reporting environment is constantly evolving, and it is crucial for businesses to adapt to these changes to ensure compliance and accurate financial statements.