



Request for Proposals
For
Selection of Master System Integrator (MSI) for
Implementation of Intelligent Integrated Traffic
Management System (ITMS) for ISCDL, Indore
Volume II: Terms of Reference (ToR)

NIT Number: 87/ISCDL/2018-19

Dated: 07/03/2019

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Definitions/Acronyms

Terms	Meanings
ABD	Area Based Development
AMC	Annual Maintenance Contract
ANPR	Automatic Number Plate Recognition
ATCS	Adaptive Traffic Control System
BOM	Bill of Material
CCTV	Closed Circuit Television
COTS	Commercial Off-The-Shelf
DC	Data Centre
DMS	Document Management System
DRC	Disaster Recovery Centre
ECB	Emergency Call Box
EMD	Earnest Money Deposit
FMS	Facility Management Services
GIS	Geographical Information Systems
GPS	Global Positioning System
GSM	Global System for Mobile Communication
GST	Goods and Services Tax
ITMS	Integrated Command and Control Centre
ICT	Information and Communication Technology
ICCC/CCC	Integrated Command and Control Center
IP	Internet Protocol
IPF	Information Processing Facility
ISO	International Organization for Standardization
IT	Information Technology
ITDP	Institute for Transportation and Development Policy
ITMS	Intelligent Traffic Management System
LOA	Letter of Acceptance
MIS	Management Information System
MSI	Master System Integrator

RFP for Selection of Master System Integrator (MSI) for Implementation of Intelligent Integrated Traffic Management System (ITMS) for ISCDL, Indore



Terms	Meanings
NIT	Notice Inviting Tender
OEM	Original Equipment Manufacture
OFC	Optical Fiber Cable
PA	Public Address
PoP	Point of Presence
PTZ	Pan Tilt Zoom
RFP	Request for Proposal
RLVD	Red Light Violation Detection
ISCDL	Indore Smart City Development Limited
SDC	State Data Centre
SLA	Service Level Agreement
SOP	Standard Operating Procedures
SPV	Special Purpose Vehicle
SVD	Speed Violation Detection
TCV	Total Contract Value
TDS	Tax Deducted at Source
TPA	Third Party Auditor
UAT	User Acceptance Testing
UPS	Uninterrupted Power Supply
VAT	Value Added Tax
VM	Virtual Machine
VMS	Variable Message Sign

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1 Introduction

1.1 Project Background

One of the primary objectives is to enhance the safety and security, improve efficiency of city administration and promote a better quality of life for residents. In order to achieve these objectives, ISCDL desires to foster the development of a robust ICT infrastructure that supports digital applications and ensures seamless steady state operations, traffic management, emergency response mechanisms and real time tracking of services and vital city metrics throughout the city. ISCDL is considering the appointment of a MSI to set up Integrated Traffic Management System for Indore.

Currently there is Integrated Command & Control Center available at Indore. Madhya Pradesh Police Department has already deployed some CCTV Surveillance cameras and Command Control Center for monitoring video feeds in existing ITMS.

The objective of Madhya Pradesh Police City Surveillance project is Citizen Safety and Security and enabling city to plan events, effective monitoring of infrastructure, track incidents enabling quicker response etc. It's also helping in enforcement of law, monitoring of public areas, analyze patterns and other following aspects:

- Quicker response to incidents;
- Assistance for more effective operations;
- Improved situational awareness

1.2 Project Objectives

- a. The key objective of this project is to establish a collaborative framework where input from different functional departments such as transport, e-governance, etc. can be assimilated and analysed on a single platform; consequently resulting in aggregated city level information. Further this aggregate city level information can be converted to actionable intelligence, which would be propagated to relevant stakeholders and citizens.
- b. Implementation and Integration with services in the city, where applicable (existing and planned infrastructure with provision for future scalability) are given in section below.
- c. As part of the scope of services, the indicative high level requirements are supplied to improve the clarity.

1.3 Purpose of this RFP

The Ministry of Urban Development (MoUD), Government of India launched Smart cities mission. Main objective of this mission is to develop cities to provide core infrastructure and give a decent quality of life to its citizens, a clean and sustainable environment and application of 'Smart' Solutions. The focus is on sustainable and inclusive development and the idea is to look at compact areas, create a replicable model which will act like a light house to other aspiring cities.

Indore is one of the ULBs selected under the 1st Round Competition of SCM based on the Smart City Plan (SCP) submitted by the City through Government of Madhya Pradesh. The ULB, based on the public consultation, has prioritized sub-projects in the SCPs, which need to be reviewed, improved, finalized and implemented. In order to implement/realize these plans a Special Purpose Vehicle (SPV) – Indore Smart City Development Limited (ISCDL) is established.

This document talks about current state, key issues and smart solutions which are going to be covered in the RFP for ITMS and Integration with existing Command Control and Communication Center (i.e. ICC and existing ITMS) for City of Indore, in accordance to the guidelines laid out by Smart cities mission.

2 Project Overview and Components

Key foundation components for Indore Smart City considered for this RFP are:

- a) Intelligent Traffic Management System
 - Adaptive Traffic Control System (ATCS)
 - Smart Traffic Sensors for Traffic management and Analysis
 - Automatic Number Plate Recognition (ANPR) System
 - Red Light Violation Detection (RLVD) System
 - Speed Violation Detection (SVD) System
 - Traffic Violation Cameras
 - Variable Message Sign boards
 - Video Management system and VA
- b) Operation and Maintenance Phase

The MSI shall also be responsible for supply of IT solution for the management of hardware and application software, networking, installation, Training, Maintenance and operations of the solution for 7 years from the Go-Live date of implemented solutions for Indore in an efficient and effective manner.

2.1 Components & Services Scope Overview

The selected MSI shall ensure the successful implementation of the proposed solutions as well as provide capacity building support to city authorities as per the scope of services described below. Any functionality not expressly stated in this document but required to meet the needs of the ISCDL to ensure successful operations of the system shall essentially be under the scope of MSI and for that no extra charges shall be admissible. MSI shall implement and deliver the systems and components which are described in this RFP.

MSI's scope of work shall include but will not be limited to the following broad areas. Details of each of these broad areas have also been outlined in Annexures:

1. Assessment, Scoping and Survey Study: Conduct a detailed assessment, survey, gap analysis, scoping study and develop a comprehensive project plan, including:
 - a) Assess existing systems and infrastructure.
 - b) Conduct site survey for finalization of detailed technical architecture, gap analysis, final Bill of Quantities and project implementation plan
 - c) Conduct site surveys to identify the need for site preparation activities
 - d) Obtain site clearance obligations & other relevant permissions with the support of ISCDL
2. Design, Supply, Installation, Testing and Commissioning of the following primary components:
 - Intelligent Traffic Management System

- Adaptive Traffic Control System (ATCS)
- Smart Traffic Sensors for Traffic management and Analysis
- Automatic Number Plate Recognition (ANPR) System
- Red Light Violation Detection (RLVD) System
- Speed Violation Detection (SVD) System
- Traffic Violation Cameras
- Variable Message Sign boards
- Video Management system and VA

The detailed requirements of the above would be delineated within the subsequent sections.

2.2 Data Centre within ICC Building

MSI need to leverage the existing ICC Data Center and NOC at Indore.

2.3 Intelligent Traffic Management System

The MSI shall ensure the successful implementation of the proposed Intelligent Traffic Management System (ITMS) and shall provide capacity building support to city authorities as per the scope of services described below. Any functionality not expressly stated in this document but required to meet the needs of the ISCDL to ensure successful operations of the system shall essentially be under the scope of the MSI and for that no extra charges shall be admissible. MSI shall be responsible to install ITMS systems which are being not included in the Indore Police project. (Tentative locations of Traffic Junctions are given at Annexure A of this Volume of the RFP.)

The following key tasks shall be covered under this initiative:

- a) To provide CCTV cameras including Fixed cameras for live video monitoring of key traffic junctions
- b) To provide an integrated traffic management platform for viewing, controlling and managing all the traffic components installed across the city.
- c) To monitor the ongoing activities of the key traffic junctions from the ITMS.
- d) To facilitate traffic rules enforcement through design, supply, and installation of Red Light Violation Detection (RLVD) and speed violation detection. Each of these systems shall be integrated with the ITMS.
- e) To integrate e-challan system with traffic enforcement cameras, sensors, echallan handheld devices for automated issuance of challans
- f) To provide API integration of Variable Message Sign boards with existing/proposed Smart City Infrastructure to provide real time information and services, such as traffic related, journey planners and accident reporting

- g) To create a Centralized Management Information System (MIS) as a part of the IT solution for faster decision making in traffic emergency such as heavy rain fall, accidents, terrorist attack, VVIP movements etc.
- h) To create centralized Traffic data management including, real time traffic monitoring, traffic status, count, classification, gap, head way, occupancy, average speed and provide historical as well as live data to manage traffic in present and near future and help decongestion.
- i) To operate, manage and train the administrative staff and offer back-end support on the operations of the ITMS using the departmental manpower

MSI shall implement and deliver the following systems and capabilities linked with ACTS & ITMS Platform.

- a) ITMS Platform
- b) Adaptive Traffic Control System (ATCS)
- c) Smart Traffic sensors for smart traffic management and planning
- d) Automatic Number Plate Recognition (ANPR) System
- e) Red Light Violation Detection (RLVD) System
- f) Speed Violation Detection (SVD) System
- g) E-Challan
- h) Traffic Violation Cameras
- i) Variable Message Sign boards

2.4 Adaptive Traffic Control System (ATCS)

As part of the Smart City mission, the city of Indore also wants MSI to supply, install, commission and maintain an Adaptive Traffic Control System (ATCS) at 65 junctions for 7 years. The key features of the system being:

- Adaptive system – The system shall change traffic signal timings based on inputs from non-intrusive 4D HD radar based vehicle detectors deployed at each approach of each junction.
- Standards compliant – The system shall employ industry standard open communication protocols like UTMC/UG405/NTCIP.
- Tactical traffic control – The system shall be capable of managing the traffic signals in near real-time, based on inputs from the traffic detectors.
- Strategic traffic management – The system shall use data fusion models to understand the current state of the network, employ short term prediction models and then use

simulation models to strategically manage traffic across the network, before things get worse.

- Central control centre – The CCC is expected to act as the core of the system. The system shall employ a reliable communications network to ensure maximum availability for the communication link between the CCC and the traffic signals.

2.4.1. Objectives:

1. Manage traffic centrally, while receiving traffic inputs from sensors
2. Optimally configure the traffic signal timings, in near real time
3. Minimize traffic congestion and waiting time
4. Improve Journey Time Reliability
5. Ensure smooth movement of emergency response vehicles like ambulances, police etc.
6. Manage VIP movements better
7. Perform data analytics on the traffic data to analyze travel demand and manage traffic effectively
8. Send real time information to commuters
9. Improve compliance with traffic rules
10. Generate count and classification data for each approach

3 Scope of work:

3.1 Preliminary surveys:

- Collect data of existing operating conditions, traffic volumes across various time periods of a day, which will cover all peak and non-peak hours, weekends, etc., saturation flow rates, travel times along major corridors during different times of the day. At the minimum, the following data shall be collected:
 - Classified turning movement counts for vehicles at major junctions
 - Pedestrian volumes at major junctions
 - Physical and visual characteristics of the area
 - Travel times, delays between different points on the network
 - Additional dependencies with respect to the available infrastructure and geometry at the junctions

Study the existing traffic management systems and processes deployed by the competent authorities, MIS reporting needs, problem areas and expectations of the city. Perform Gap Analysis and finalize the key requirements with the city.

3.2 Design and planning:

- Prepare the solution architecture and design drawings
- Seek approval of the designs from the city
- Prepare the execution plan and get it approved by the city
- Prepare work zone safety and traffic management plans

3.3 Installation and commissioning:

- Procure, supply and install 4D HD radar-based vehicle detectors, controllers and other required accessories as per the approved design
- Procure, supply and install all relevant hardware, like servers and workstations in the CCC
- Connect the signal controllers to the CCC and ITMS via a suitable communications media
- Install the ATCS software in the servers within the CCC
- Integrate all components of the system and configure the traffic signal plans at each of the junctions, for varied operating conditions like peak and off-peak traffic, weekend traffic, traffic flows during special events etc.

4 Functional requirements of ATCS

4.1 General:

- The system would be used to monitor and control traffic signals, including signalized pedestrian crossings, using a traffic responsive strategy based on real time traffic flows obtained using vehicle presence sensors.
- All signal controllers under Adaptive Traffic Control System shall be provided with inputs from non-intrusive 4D HD radar vehicle detection sensors for detecting demand and communications equipment to send the demand data and to receive instructions on the control strategy in near real-time.
- The system shall use 4D HD radars to get accurate count, classification, vehicle presence at stop lines, average speeds, etc. in all weather conditions.
- The system should be extensible to add more signals whenever required.
- Any existing infrastructure at the junctions that might help in traffic control, where possible, should be integrated with ATCS.
- ATCS shall use standard communication protocols UG405 or NTCIP. It should also provide the functionality of integration with on-ground hardware of any third-party traffic controller that is UTMC/UG405/NTCIP compliant.

4.2 Traffic Detectors:

- The detection system must be non-intrusive (i.e. above ground) and shall consist of:
 - 4D HD radar forward firing radar
- The single sensor should be able to cover at least 4 lanes and 175 meters
- The detector should not require cleaning and should perform in bad weather like fog, rain and dust
- The sensor should be able to simultaneously track at least 125 objects and should not have any dependencies on temperature or image
- The sensor performance should not vary with temperature variation of road and other climatic conditions
- The traffic sensor shall be able to detect the presence of vehicles near stop-line and do advance detection for vehicles to check ETA, Traffic volume, count, classification and average speed
- The detector shall have at least 175m of working range
- The detector shall work in all weather conditions including rain, fog and any other weather conditions relevant to Indore city without any drop in accuracy levels
- The detector shall be able to cover up to 4 lanes.
- The detector should be IP 67 and should be able to work upto 80 degrees
- The detector should have flexibility of installation on the roadside, at the corner of an intersection, at the median of a highway or on a gantry, with best results, not like side-firing technology, needing set-back from the road and having high occlusion risk
- The refresh time should be better than 70ms
- The OEM of the sensor should have atleast supplied 50000 traffic radars as on date

- The detector shall be capable of
 - Counting the vehicle with at least 90% accuracy in standard traffic conditions
 - Classification of the vehicle with at least 3 classes
 - Queue lengths

4.3 Traffic Signal Controller

- The controller shall have a facility to list all conflicting phases at an intersection. After configuration, a traffic engineer shall verify that the signal aspects are running as expected, for each and every program coded in the controller, before being put to use.
- The controller shall be able to take queue inputs from the 4D Radar and optimize the signal timing on the basis of queue lengths.
- During power up the controller shall initially execute the Flashing Amber / Flashing Red plan for a time period of 3 Seconds to 10 Seconds. The default value of this Starting Amber is 5 Seconds. Facility shall be available to configure the time period of Starting Amber within the given limits at the site.
- Health monitoring should be available for the traffic controller and the signal aspects in all modes of operations.
- A hardware failure leading to a conflict condition (due to faulty devices or short circuit in the output) shall force the signal into Flashing Amber/ Flashing Red.
- The controller shall be able to interface with the 4D Radar detector using an industry standard open collector interface as well other standard communication protocols as per the requirement.
- The signal controller shall have a police control panel with:
 - Hurry call buttons,
 - Auto/Manual selection button,
 - Manual advance button,
 - Normal/Flashing mode button, and
 - Junction On/Off button.
- The controller shall have the following modes of operation:
 - Fixed time mode - the controller shall execute a pre-set program, which does not consider the inputs from the traffic detectors.
 - Vehicle actuated mode - the controller shall execute pre-set programs that do not have fixed green times. The green time for each approach shall be bound by the constraints of minimum green and maximum green times. The actual green time is determined based on the vehicular demand obtained from the traffic detectors.
 - ATCS mode - the controller shall execute the programs determined by the ATCS application in the control centre and shall take inputs from traffic detectors to optimally split green times.
- The controller shall either have a fixed operator console or a portable one to allow traffic engineers to program the controller on-site.
- It should be possible to configure a program and set it remotely from the control centre.

- The controller shall allow interfacing with the ATCS application using an industry standard protocol such as UTM/UG405 or NTCIP. No proprietary communications protocol shall be allowed, in any case.

4.4 ATCS Application

- The application is at the core of the system and shall be hosted on a server in the control center.
- The application should allow creation of green corridors to ensure priority movement of Emergency Response vehicles, such as ambulances, fire engines and police vehicles.
- The application shall interface with a popular microscopic traffic flow simulation software for pre and post implementation analysis and an online simulation for study of the proposed ATCS control strategy at various times of the day. The simulation shall be capable of identifying the impact of any anomaly in the system along with the strategy chosen. The simulation model shall assist the traffic engineers/police to identify the best possible strategy in any unusual/unprecedented event.
- The application shall be estimate a comprehensive network state using data from ANPR, GPS or any other such data collected from other third party sensors/detectors/cameras.
- The application should be capable of running in the following four modes:
 - **Connected signals mode:** This mode should enable traffic police personnel to remotely configure and control the signal timing plans using the ATCS interface available in the CCC.
 - **Automatic plan switching mode:** The system should be configured to run the most appropriate signal timing plan for a group of junctions from a library of signal plans. The system should automatically select the most appropriate plan for the prevalent traffic conditions based on a set of customizable rules.
 - **Optimization mode - tactical:** Signal timings for a group of junctions should be optimized for pre-defined performance indicators, like delays, travel times and queue lengths. Short term prediction models shall forecast the traffic demand for 5, 10 and 15 minutes. The traffic demand shall be input into a traffic online simulation model and the outputs of the simulation model shall be employed to establish performance indicators. The optimization model shall use these performance indicators to determine optimal signal timings.
 - **Optimization mode - strategic:** The system shall have a strategic traffic control layer on top of the tactical control logic. The strategic control layer should monitor traffic detector data and performance indicators in near-real-time, compare them against average values for the given time of the day and day of the week (profiles) and generate operator alerts when an anomaly is observed. In addition, the system should predict the values of traffic variables and performance indices into the short-term future (5, 10 and 15 minute ahead intervals) and generate warnings before the onset of anomalies where feasible using machine learning techniques. When anomalies are detected, the system shall evaluate potential traffic control strategies using faster than real-time modelling using a traffic simulation software and suggest appropriate strategies to the traffic operator. The strategic control should also be able to

dynamically change the base signal plans used by the tactical control based on near-real-time detector data based on user defined rules. The strategic control layer should also estimate the state of the road network, including an estimate of traffic state on links without any detection, using data from traffic detectors and other data sources such as ANPR and GPS (if available) to provide a unified operational view of the road network.

- The application shall have a Graphical User Interface (GUI) with an underlying GIS map that shall display the network and the traffic signals, traffic cameras/detectors, Variable Message Sign (VMS) boards and Public Address (PA) systems deployed.
- ATCS application should be capable of displaying live video from CCTV cameras that have been deployed for traffic surveillance.
- The GUI shall provide:
 - Flexibility to the operators to zoom and navigate with ability to interact with objects on the map.
 - Interoperability across multiple platforms.
 - Web browser based access, requiring no local setup on the
 - Graphically present signal plan execution and traffic flow at the intersection on desktop
- The GUI shall have the following features:
 - User login – Operator authentication shall be verified at this screen with login name and password.
 - Network Status Display – This online display shall indicate with appropriate color coding on site map whether an intersection under the ATCS is online or off. On double clicking the intersection a link shall be activated for the traffic flow display for the intersection.
 - Live video feed – The operators shall be able to see the live video feed from CCTV cameras that have been deployed for traffic surveillance.
 - Traffic Flow Display – This online display shall indicate the current traffic flow with animated arrows, mode of operation, stage number being executed and elapsed stage time.
 - Saturation Snapshot – This display shall show the current saturation levels of all intersections in a corridor.
 - Reports printing / Viewing – This link shall allow selection, viewing and printing of different reports available under ATCS.
 - Time-Space Diagram – The time-space diagram shall display the current stages being executed at every intersection in a corridor with immediate previous history. Junctions shall be plotted proportional to their distance on Y-axis and time elapsed for the stage in seconds on X-axis.
- ATCS application shall graphically show the execution of the signal plans, in real-time.
- The solution should include the following reports at a minimum:
 - Stage Timing report – The report shall give details of time at which every stage change has taken place. The report shall show the stage sequence, stage timings and stage saturation of all stages of all cycles for a day.
 - Cycle Timing report – The report shall give details of time at which every cycle has taken place.

- Stage switching report – The report shall give details of time at which a stage switching has taken place. The report shall show the stage sequence, stage timings and stage saturation for a day.
- Cycle Time switching report – The report shall give details of time at which a cycle switching has taken place.
- Mode switching report – The report shall give details of the mode switching taken place on a day.
- Event Report - The report shall show events generated by the controller with date and time of event.
- Power on & down: The report shall show time when the master is switched on, and last working time of the master controller.
- Plan Change – The report shall show the time of change of plan either through keypad or remotely through a PC or Server.
- Mode Change – The report shall show the time when Master controller's operating mode is changed either manually through keypad or a remote server. The typical modes are FIXED, VA, FLASH, LAMP OFF and HURRY CALL.
- Count & Classification Report – The report shall show the count & classification data on each approach at various times of the day. It shall be possible to extract/integrate this data for other applications.
- Queue Report – The report shall show the queue lengths at each approach of the junction at various times of the day. It shall be possible to identify the impact of the queue length on the signal timings.
- Lamp Status Report – The report shall show lamp failure report with date and time of failure, colour of the lamp and associated phase.
- Detector Failure Report – The report shall show the date and time of detector failure with detector number and associated phase.
- Conflict – The report shall show the conflict between lamps (RED, AMBER, GREEN) in the same phase or conflict between lamps with other phase.
- Corridor Performance Report – The report shall show the saturation of all the intersections in a corridor for every cycle executed for the corridor and the average corridor saturation for a day.
- Corridor Cycle Time Report – The report shall show the Corridor cycle time, Intersection cycle time, Mode of operation and degree of saturation of all the intersections in a corridor for every cycle for a day.

4.5 Selective Vehicle Priority & Compensation Module

In-line with the vision of making the city smarter, the authorities are very keen to make the junction smart enough to provide the **selective vehicle priorities to the emergency & VIP vehicles and public transport buses**. The system shall provide following functionalities:

- The ATCS system shall interface with the **GPS device in the bus/ambulances** and provide them the priority in crossing the junction.

- It shall also be possible to **integrate the RFID reader** in the ATCS system for identifying the buses & other vehicles of significance near the junction to providing priorities.
- The system shall be able to determine the **priority order** of each vehicle when there are multiple priority vehicles simultaneously present at a given junction, and accordingly determine which get the priority first.
- The **priority** can be given either as an extension to green stage or a forced switching to a green stage depending on the **current state of the signal**.
- The system shall also **compensate** the other stages for the lost green after the passage of the priority vehicle in order to minimize congestion.
- An additional **mobile application** shall be provided for emergency/VIP vehicles without GPS devices with following features:
 - Role-based selective user login
 - Emergency mode on/off
 - Auto timeout feature of the emergency mode
 - GPS based location information to the ATCS system

5 Technical Specifications of ATCS Components

5.1 Traffic Signal Controller

Traffic signal controller in conjunction with an Outstation Transmission Unit (OTU) should be able to run any ATCS algorithm having demand actuated dynamic signal timing plan selection. The communication between the controller and the ATCS software shall happen over industry standard UTMC/UG405/NTCIP protocols. The following specifications are to be adhered with, either directly or using the OTU:

1. Power supply: 230 V AC @ 50 Hz
2. Communication protocol: UTMC/UG405 or NTCIP
3. Number of signal groups: 16 minimum
4. Number of signal head outputs: 32 minimum
5. Number of phases: 16 minimum
6. Number of signal plans: 32 minimum
7. Number of stages per plan: 16 minimum
8. Number of detector inputs: 16 minimum
9. Interfaces: Ethernet, RS232, USB
10. Signal head compatibility: 230 V AC @ 50 Hz or 12/24/48 V DAC
11. Hurry Call Buttons: Minimum 4
12. Police Control Panel: Yes, with hurry calls and push to change buttons
13. Temperature: 0°C to 60°C
14. Communication standard: UTMC/UG405 or NTCIP protocol over TCP/IP
15. Media interfaces:
 - 1 x 10/100 Ethernet interface
 - 2 x USB 2.0 host ports
 - 1 x micro USB 2.0 port
 - 1 x RS232 port
 - 1 x RS485 port
16. RAM: 128 MB SDRAM minimum
17. Storage Capacity: 512 MB minimum
18. Timing Resolution: Minimum 100 m.sec. (input resolution to 2ms)
19. Input Pins for detectors: Minimum 16 Open Collector Interface pins
20. Cabinet: IP66 or better

5.2 Traffic Sensor

The Traffic detector shall be a 4D forward firing radar with refresh time of better than 75 ms and should comply to below specifications

The vehicle detector used should be forward firing 4D Radar with high definition for making Intersections and traffics lights smarter. The sensor should work with in the frequency band of 24 GHz or 77 Ghz

Vehicle detector should be able to work in Fog, Rain, darkness night and in dust environment and should not have cleaning requirement as in video sensors

The vehicle detector should have had a wide field of view of 40 degrees, and at the same time a range of up to 180m

Vehicle detector should be multilane and should detect up to 125 individual objects simultaneously, and measure their position and speed

The sensor should have 4D object tracking and should measure (X, Y, speed and elevation) Cartesian coordinates or polar coordinates range, azimuth and elevation angle, as well as the speed vector simultaneously for up to 126 objects

The 4D with HD technology used should provide high-resolution capability in scenarios where many vehicles are closely spaced, i.e. in many lanes, dense traffic, traffic jams, stop and-go situations

One single sensor should allow up to 16 virtual loops and should have very high detection performance compared to video detectors.

Vehicle detector should detect moving and stopped traffic i.e. should detect vehicles, no matter if stopped or moving. Up to -320 km/h--+320km/h: no matter what the traffic direction.

Proposed radar should be manufactured by company who has experience of radar technology and should have manufactured more than 50000 Radars, should have service centre in India.

5.3 Traffic Signal Aspect

- Maximum power consumption for any color aspect - 12 W
- Temperature compensated power supplies
- Diameter: 300mm
- Uniform appearance light diffusing
- Units operate at 230 V AC @ 50 Hz or 12/24/48 V DC
- Operating temperature: 0°C to 60°C
- Signal head ingress: IP 55
- LED module ingress: IP 65
- Impact resistance: IR 3
- EN 12368 certified
- Auto-night dimming feature
- ISO 9001 certified OEM
- UV Stabilized Shield
- Auto-night dimming feature

5.4 Countdown Timer

- Power Consumption: Maximum 30 Watts per lamp
- Input Power: 230 V AC @ 50 or 12/24 V DC
- Operating temperature: 0°C to 55°C
- Humidity: 0% to 95% Relative
- Digit Height: 210 mm at least
- EN 12966: Compliant
- Color: Dual (Green & Red)
- For pedestrian, integrated unit with alternate timer and stopman/walkman in dual color
- For vehicular traffic, integrated unit with dual color with option of displaying STP or GO as well

5.5 Automatic Number Plate Recognition (ANPR) System

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

1. The MSI shall install the ANPR Cameras at 58 junctions/locations (the final no. might vary based on field survey by MSI) across the city. This system shall automatically capture the license number plate of the vehicle at these junctions.
2. The MSI shall design, supply, and install the ANPR camera system as defined in the RFPs, all camera accessories such as IR Illuminators, camera housing and mounting shall be installed by the MSI. The MSI shall supply all of the necessary equipment for the camera and local processing system, including but not limited to: computers, local storage, and ancillary camera equipment, camera poles, warning signs and shall make the final connections to the camera. Complete camera unit have IP test report and CE certificate including IR
3. The MSI shall be responsible for providing all the necessary IT infrastructure for

detection, analysis, storage & retrieval of the number plate information at ITMS or any other location as specified in the RFP.

4. The OEM should have experience of supplying ANPR systems in 3 cities with 100 systems each.

5.6 Red Light Violation Detection (RLVD) System with Option of Speed

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

1. The MSI shall install the RLVD Systems at 58 traffic junctions (the final no. might vary based on field survey by MSI) across the city. This system shall capture the infractions of Red light and stop line violations at these junctions. In some of these junctions which are prone to accidents speed will be also installed (10% of the traffic arms)
2. The MSI shall design, supply, and install the RLVD system as defined in the RFPs, all wiring connections to the traffic signal controllers and to the camera platforms shall be installed by the MSI. The MSI shall supply all of the necessary equipment for the camera and detection system, including but not limited to: computers, ancillary camera equipment, camera housings, camera poles, warning signs and shall make the final connections to the camera.
3. The Systems should have proper certification for RED SPEED. The OEM should have certification in his name and a test report as well as certificate/legal decree should be submitted. The test reports for the speed system should be in accordance to OIML R91 D11 welmec 7.2
4. The solution should be based on 3D UHD radars and video systems proposed by the MSI shall seamlessly integrate with the E-Challan system proposed under the scope of this project. ISCDL shall facilitate to get access to the Vaahan and Sarathi database. MSI shall be required to access the same through use of appropriate APIs.
5. The MSI shall be responsible for providing all the necessary IT infrastructure for analysis, storage & retrieval of the infraction information at ITMS or any other location as specified in the RFP.
6. The

5.7 Average Speed Violation Detection (SVD) System.

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

- 1- Technology to be used is non-intrusive and should have proper test reports and Certificates.

The measure of vehicle speed shall be the Average Speed in a control section. All vehicles passing through the control section at a Speed greater than a determined speed limit (values to be made configurable via software) shall be detected as violation and System shall

produce two images relative to any vehicle in violation, one for each detection point and the value of average speed detected.

- 2- To ensure the best performances, the system should be able to detect vehicles in violation not by executing ANPR processes in local control sections but executing plate matching with following method:
 - Extracting alphanumeric characters from pictures taken by cameras located in at least two different points within a certain distance that shows transit vehicles
 - Cameras has to be synchronized, by an adequate synchronization means (i.e. GPS) and said pictures has to be taken only within a predetermined time interval; said predetermined time interval is lower than a predetermined threshold Time and higher than a predetermined threshold Time, said threshold Time being the time needed for the moving object to cover said certain distance at a predefined speed limit and said threshold Time being the time needed for the moving object to cover said certain distance at a speed at least two times higher than said predefined speed limit.
 - converting, by a computing algorithm in peripheral units, alphanumeric characters of plates into other new non-bijective characters of a second representation space;
 - creating, by said computing algorithm, a string of said new non-bijective characters for each of the tags extracted from the pictures taken by the cameras at different locations,
 - comparing, in the central unit the strings by associating a correlation score;
 - inputting a threshold score;
 - identifying, in the central unit, the speeding vehicle in violation if the correlation score is above the predetermined threshold score
- 3- This method ensure maximum violation detection rate also for vehicles plates that are not readable with ANPR systems, for example broken plates, dirty plates, other languages, nonstandard plates.
- 4- System shall have provision for setting different speed thresholds (corresponding to different time intervals in which analyze vehicles) for minimum of two vehicles categories (light, commercial). System shall perform in Rain, bad weather & day and night conditions
- 5- The system should have proper certification and legal decree. Test reports of accuracy and decree should be submitted for the same.
- 6- The OEM should have supplied certified Red speed system in at least 10 projects across the globe and 1 project in India.

5.8 Speed Violation Detection (SVD) System.

1. The MSI shall install the Speed Violation Detection Systems at 30 locations (the final no. might vary based on field survey by MSI) across the city. This system shall capture the infractions of speed violations at these locations and MSI will make sure that systems supplies are properly certified with proper legal decree and test reports. The proposed system should have proper test certification in compliance with OIML R 91,

D11 and welmec 7.2 regulation for the solution in name of OEM.

2. The MSI shall design, supply, and install the speed violation detection system as defined in the RFPs, all wiring connections for the system shall be installed by the MSI. The MSI shall supply all of the necessary equipment for the camera and forward firing technologies that can track at least 62 objects with refresh time of better than 50 ms, including but not limited to: sensors, computers, ancillary camera equipment, camera housings, camera poles, warning signs and shall make the final connections to the camera.
3. The solution proposed by the MSI shall seamlessly integrate with the E-Challan system proposed under the scope of this project.
4. The MSI shall be responsible for providing all the necessary IT infrastructure for analysis, storage & retrieval of the infraction information at ITMS or any other location as specified in the RFP.
5. The OEM should have supplied the system in atleast 10 projects and 1 project in India.

5.9 Traffic Violation Cameras

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

1. The MSI shall install additional fixed cameras with ANPR capability for detection of violations of wrong side vehicle movements at 58 locations (the final no. might vary based on field survey by MSI) across the city.
2. The MSI shall design, supply, and install the traffic violation cameras as defined in the RFPs, all wiring connections for the system shall be installed by the MSI. The MSI shall supply all of the necessary equipment for the camera and detection system, including but not limited to: computers, ancillary camera equipment, camera housings, camera poles, warning signs and shall make the final connections to the camera.
3. The solution proposed by the MSI shall seamlessly integrate with the E-Challan system proposed under the scope of this project.
4. The MSI shall be responsible for providing all the necessary IT infrastructure for analysis, storage & retrieval of the infraction information at ITMS or any other location as specified in the RFP.

5.10 Traffic Control, Information and Management System

Indore smart city is looking forward to having real time traffic monitoring of major strategic arterial/urban road network across the city which allows real time data traffic monitoring, having traffic status from all such locations. In addition, the solution should provide live traffic status, average speed, gap, headway & occupancy, counting, classification data. The data will not only provide real time information of traffic information but will also help in planning resource allocations based on traffic status and possible forecast. The data should be collected and stored and should be available to traffic

police and authorities/CCR to compare them with present data or help in forecasting of traffic helping in better management of city roads and traffic management. The entry and exit of some stretches roads/zones will be done initially to evaluate flow of traffic and evaluate its effect on traffic conditions at various times of the day/weeks etc.

The sensors should not be image dependent, should not require cleaning activities and should work with minimum bandwidths available.

The analysis and processing of traffic data software should provide customizable reports both in tabular and in graphical form, based on the variables of interest as agreed with client during execution. The report generation can be done by selecting various parameters through a simple and intuitive graphical interface allowing to achieve maximum flexibility, or by selecting the standard reports with variables previously set.

Include:

- Average daily traffic weekday / holiday / seasonal
- Average hourly traffic weekday / holiday / seasonal
- Peak hour traffic
- Thirtieth rush hour
- Trend of variation of daily traffic

In addition to the reports mentioned above, further ten standard reports will be implemented for evaluating the traffic (eg traffic per month, annual traffic, hours of slow traffic per day / month / season, hours of stopped traffic (queue) daily / monthly /seasonal ...) accordingly to the client's needs.

The main functionalities which are required at traffic suit at CCR are:

- 1) GIS: interactive map/synoptic allowing easy and quick monitor of the equipment located in each position.
- 2) Visualization of summary and detailed information from the traffic monitoring sub-systems
- 3) Visualization of alerts and anomalies reported by monitoring sub-systems;
- 4) Visualization of "real time" data from the traffic monitoring system by selecting an item on the map;
- 5) Access to control and configuration interfaces of each traffic count station.
- 6) Access to the diagnostics of substations
- 7) Access to historical traffic data and statistics
- 8) Various data comparison possibilities for hourly, daily or weekly to evaluate traffic data
- 9) Complete back up of data for at least next 5 years
- 10) Graphical interpretation of data

11) Optional (time to travel & other information's with possibility of integration with VMS)

The sensor will be placed in strategic locations to provide accurate count, classification, gap, headway, occupancy, average speed, traffic status etc for traffic control, planning and management for present and future traffic planning.

S.No	Functions	Minimum Specifications- Traffic Sensors
1.	Technology	System should work in day and night condition and should use time of light measurement using scanning laser 905nm non-visible with integrated optional doppler technology.
2.	Processor	The processor should be minimum an ARM9 microcontroller clocked at 400 MHz with an internal memory of 64 MB SDRAM and 128 MB FLASHES. Power consumption should be less than 5W.
3.	Main features	System should provide vehicle count, class of vehicles (minimum 8 class when installed over the lane and 4 classes when installed on the side for multilane. Sensor should be able to distinguish between car, Bus truck, trailer auto etc) and other information to be used for ITMS viz. Transit id, direction, classification, counting, height, occupation time, headway time, average speed and Traffic status. OEM should be able to replace a class with new classification of vehicle. For example if client wants to add an auto rikshaw with a pre-existing vehicle.
4.	Precision	Maximum error permissible $\pm 5\%$ for counting and classification in a single lane with 3D image option in standard traffic condition. in 2 lane installations sensor should be able to provide accuracy of minimum 92%.
5.	Measurement	Sensor should make 274 measurements on 4 planes with an opening angle of 96° with speed from doppler when radar is fixed inside the sensor.
6.	Scan angle	96 degrees
7.	Power consumption	Less than 7W, transmission power 16 dB
8.	CE & RoHS Compliance	CE and RoHS compliant certificate with third party speed test report

S.No	Functions	Minimum Specifications- Traffic Sensors
9.	Reference	The hybrid sensors should have already been use at least in one project with minimum 100 sensors. Order copy should be attached.

5.11 Variable Message Sign board application

- i. Central Control Software shall allow controlling multiple VMSB from one console.
- ii. Capable of programming to display all types of Message having alphanumeric character in English and Hindi and combination of text with pictograms signs. The system should have feature to manage video / still content for VMSB display.
- iii. The system shall have capability to divide VMSB screen into multi parts to display diverse form of information like video, text, still images, advertisements, weather info, city info etc.
- iv. Capable of controlling and displaying multiple font types with flexible size and picture sizes suitable as per the size of the VMSB.
- v. Capable of controlling brightness & contrast through software.
- vi. Capable to continuously monitor the operation of the Variable Message sign board, implemented control commands and communicate information to the Traffic Monitoring Centre via communication network.
- vii. Real time log facility – log file documenting the actual sequence of display to be available at central control system.
- viii. Multilevel event log with time & date stamp.
- ix. Access to system only after the authentication and acceptance of authentication based on hardware dongle with its log.
- x. Report generation facility for individual/group/all VMSBs 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.
- xi. Configurable scheduler on date/day of week basis for transmitting pre-programmed message to any VMSB unit.
- xii. Various users shall access the system using single sign on and shall be role based. Different roles which could be defined (to be finalized at the stage of SRS) could be Administrator, Supervisor, Officer, Operator, etc.
- xiii. Apart from role based access, the system shall also be able to define access based on location.
- xiv. Rights to different modules / Sub-Modules / Functionalities shall be role based and proper log report should be maintained by the system for such access
- xv. Components of the architecture must provide redundancy and ensure that there are no single points of failure in the key project components. To take care of remote failure, the systems need to be configured to mask and recover with minimum outage.
- xvi. The architecture must 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. Using Firewalls and Intrusion detection systems such

attacks and theft shall be controlled and well supported (and implemented) with the security policy. The virus and worms attacks shall be well defended with Gateway level Anti-virus system, along with workstation level Antivirus mechanism. There shall also be an endeavor to make use of the SSL/VPN technologies to have secured communication between Applications and its end users. Furthermore, all the system logs shall be properly stored & archived for future analysis and forensics whenever desired.

- xvii. Ease of configuration, ongoing health monitoring, and failure detection are vital to the goals of scalability, availability, and security and must be able to match the growth of the environment.
- xviii. System shall use open standards and protocols to the extent possible
- xix. Facility to export reports to excel and PDF formats.

a) Remote Monitoring

- i. All VMSB shall be connected/configured to Traffic Monitoring system for remote monitoring through network for two way communication between VMSB and control Room to check system failure, power failure & link breakage.
- ii. Remote Diagnostics to allow identifying reason of failure up to the level of failed individual LED.

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

- a) Variable Message Sign Board (VMSB) referred herein) shall be installed at identified strategic locations. The location of VMSB shall be on the key junctions (mostly on the sides without obstructing the traffic) and other strategic locations with large foot fall. The VMSB software application will allow user to publish specific messages for managing traffic and also general informative messages.
- b) VMSB shall enable ISCDL/ Police to communicate effectively with citizens and also improve response while dealing with exigency situations. These shall also be used to regulate the traffic situations across the city by communicating right messages at the right time.

5.12 Functional & Technical Requirements

- b) The system shall be capable to display warnings, traffic advice, route guidance and emergency messages to motorists from the ITMS in real time.
- c) The system shall also be capable to display warnings, traffic advice, route guidance and emergency messages to motorist by using local PC/Laptops. The system shall display graphical representation of the lanes with directional arrows and colour such as green, yellow, red for depicting density of traffic
- d) The VMSB shall display text and graphic messages using Light Emitting Diode (LED) arrays.
- e) The System shall able to display failure status of any LED at ITMS.
- f) The System shall support Display characters in true type fonts and adjustable based on the Operating system requirement.

- g) The ITMS workstation shall communicate with the VMSB controller through the network. It shall send out command data to the variable message sign controller and to confirm normal operation of the signboard. In return, the ITMS workstation shall receive status data from the VMSB controller.
- h) VMSB controllers shall continuously monitor the operation of the VMSB via the provided communication network.
- i) Operating status of the variable message sign shall be checked periodically from the ITMS.
- j) It shall be capable of setting an individual VMSB or group of VMSB's to display either one of the pre-set messages or symbols entered into the computer via the control computer keyboard or by another means.
- k) It shall be capable of being programmed to display an individual message to a VMSB or a group of VMSB's at a pre-set date and time.
- l) A sequence of a minimum of 10 messages/pictures/ pre-decided sign or group of signs shall be possible to assign for individual VMSB or group of VMSB's.
- m) It shall also store information about the time log of message displayed on each VMSB. The information stored shall contain the identification number of the VMSB, content of the message, date and time at which displayed message/picture starts and ends.
- n) The central control workstation shall perform regular tests (pre-set basis) for each individual VMSB. Data communication shall be provided with sufficient security check to avoid unauthorized access.

5.13 Video Management System and VA

Video management , Video Recording and Video Analytics Software

Sr.No	Required Parameter
1	The Software shall be scalable, client server based, enterprise level capable to handle at least 1000 camera in the same system by adding camera license and server. The VMS software should be third party ONVIF Profile S Conformant and independent of camera make and shall support at least 40 different makes of camera on Native Driver to showcase tight integration. (List of Supported Camera Make to be submitted)
2	The VMS shall be able to support cameras at upto 30 frames per second and any resolution supported by the camera and the camera driver. The VMS shall automatically offer only supported fps and resolution combinations for user convenience.
3	The system shall allow the recording, live monitoring, playback of recorded video, audio and data simultaneously

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4	The VMS Management software should allow load balancing feature for effective utilisation of resources for Server and client. It can allow system to be load balancing as per remote or local usage.
5	The Software shall be able to control Bit Rate /Quality of camera , FPS , Resolution as per requirement. The same can be applied from VMS System manager itself not from the camera web browser.
6	The VMS shall allow bidirectional audio communication with the cameras Two way Audio Communication can be in 3 different Modes , Recording shall be available with Audio & video Synced together :
A	Closed Mode : In the closed mode, the audio channels are not open
B	Listen Mode : In the listen mode, the user will hear audio from the camera and any potential audio going to the camera from any other VMS client. The audio channel from current user is not open.
C	Talk Mode : In the Talk mode, the user will speak from the Client Station to the camera.
7	The VMS shall be able to integrate with other systems using video, data or digital I/O , Scheduled I/O as well as logical I/O
7	The VMS shall support inbuilt Server based Video Analytics. The license and software link should come as single package to make it easy for the user. Software should be able to handle Video Recording and Video Analytics a minimum of 100 cameras in one recorder. Recording to be done at 1080p, 20 fps.
8	VMS should support 3 motion detection methods - Comparative , Adaptive and Hermeneutic for adverse conditions
9	The VMS shall be Windows based supporting native or virtualized Windows Server 2016 and Windows 10. The VMS shall allow operation with PC Keyboard, Mouse and DirectX compliant CCTV Keyboard (Joystick).
10	The VMS OEM shall be Microsoft Gold Certified Partner for enhanced experience.
11	The VMS shall support unlimited storage and should be able to record in NAS , SAN and DAS
12	The VMS shall support H.264, H.265 , MPEG-4 and MJPEG compression methods
13	The VMS shall support multi-live streaming , multi casting and thru cast streaming methodology
14	The VMS shall support exporting video in a tamper proof format. The media player provided in the software shall automatically notify if the video or audio has been modified

15	The VMS shall provide file export tool for export of single frame of video in BMP, GIF, TIF, JPG and PNG formats and export of video files in SEF, ASF,AVI and MKV format
16	Archiving Support
17	The Client software should have a "Help" Tab which should have all the details of operation and to include all topics related to the software for the operator.
18	Quick review of the recorded video
19	Support any video resolution like CIF, 2CIF, 4CIF & HD up to 20MP.
20	Quick search of devices in the viewing application
21	Extended camera viewing on multiple monitors
22	Multi camera sequential tours
23	Digital zooming feature for live video and playback
24	Facility for exporting the video on a portable media such as pendrive/DVD/portable hard disk etc
25	The software should comply that all client to server and server to server communications are compressed and encrypted and connection specific key should be 256 bit AES and data encryption should be 256 bit AES. The exported video should be saved in SEF (Secure Export Format) for secure non tamper file system with Password key which can be set to 20 Characters. The Client application should support dual password mode for each user.
26	Video search on the basis of date, time, event, camera, location & alarm
27	Post recording motion search analysis
28	The VMS shall have the following licensing policies:
28.1	The VMS shall not have base licenses and standard channel modules. The VMS shall be flexible to provide and support licenses for any number of cameras.
28.2	The VMS licensing shall allow changing any and all of the cameras at any time without extra cost or license key change
28.3	The VMS shall not require online licensing process
28.4	The VMS shall support instant device/ Camera replacement using original IP address. The IP of the new device/ camera shall not be feeded in the software while replacing faulty camera / device
28.5	The VMS licensing shall require MAC Id of Server/ Recorder only, not of camera devices.
28.6	Recording redundancy :
28.7	The VMS shall support software inbuilt Secure Data distribution methodology for fault tolerance
28.8	The VMS Shall Support N:1 Failover for all recording server, where n=10

29	The VMS Management software should allow Dual Password Feature for Administrator.
30	Reporting
	Reporting tool shall be web based and required for analysis of Various types of alerts occurred vis a vis various time frame vis a vis camera
	It shall be possible to create various formats of reports in graphical format
	The reporting format can be saved as book mark as well as Audit trail should be possible
	It shall be possible to find out where there is more events / activities .
	It can provide reports of all the recorder Integrated separately
31	System watchdog feature be available to alert in case of failure of cameras and servers.
Client & Recorder Application	
1	Software should be of enterprise level and able to handle minimum 100 cameras with analytics in one recorder. One master recorder shall manage a system of up to min of 150 Servers with the possibility to expand the system to include multiple master recorders. Recorder Software should have a spare of minimum 10 %
2	The system management server shall run as a Windows service on one of the recorders. The system management server shall control the following: a) Overall system operation. b) Data communication between recorders and client programs. c) Maintain user and profile lists. d) Authenticate and authorize users and applications. e) Maintain system logs. f) Handle system diagnostics.
3	Software shall allow the recording, live monitoring, playback of archived video, audio and data, network transmission and changes to settings simultaneously.
4	Server software shall enable the client to dynamically create connections between Cameras and workstations and view live or recorded video on the digital monitors(audio, video, serial ports and digitalI/Os)
5	Server software shall provide the client seamless operation of all cameras and workstations available in the system regardless of the actual connection to different archive servers
6	Offered software shall use standard servers for all the processing and shall not need any proprietary server hardware

<p>7</p>	<p>The alarms may be triggered by the following events:</p> <ul style="list-style-type: none"> a. Motion (or lack of motion) in camera view b. Change in sound level c. Text data string d. Digital input signal from an external device e. Missing camera signal (resulting for example from sabotage) f. Custom event from 3rd party application. g. Video Content Analytics (VCA) event from inbuilt.
<p>8</p>	<p>The alarm management shall support the following automatic responses:</p> <ul style="list-style-type: none"> a. Pre- and post-recording upto 60 minutes of video and audio b. Opening an alarm camera window or audio window (real-time or playback) on the workstation screen c. Displaying the alarm on the alarm list d. Activating a digital output e. Turning a dome camera to a preset position f. Starting a dome camera tour g. Sending an alarm e-mail message h. The alarm management shall be able to acknowledge alarm automatically or manually
<p>9</p>	<p>The alarm management shall support the following alarm viewing features:</p> <ul style="list-style-type: none"> a. It should provide the facility to assign the priority level to different alarms. b. It should allow pass the specific alarms to specified users rather than sending all alarms to every user. c. Users in same user group should see and be able to manage received alarms assigned for the same user group. All users should see the alarm status in real time. d. System should have single alarm stack even though there are multiple recording servers
<p>10</p>	<p>Software should allow creation of multiple camera sequences. It should be possible to set the dwell time for the cameras within the sequence.</p>
<p>11</p>	<p>Software should allow taking the backup of the recorder server configuration and restoring the same if required.</p>
<p>12</p>	<p>Software should allow easy and user friendly menus for camera configurations. It shall allow changing settings for multiple cameras of the same type simultaneously</p>
<p>13</p>	<p>Software should provide totally configurable user privileges with independent user rights. The user privileges are saved in profiles which can be assigned for the required users</p>

14	Software should provide the utility to interface the recorder servers with internet. Internet Gateway server shall allow clients to view live and playback video streams, control PTZ cameras and control digital I/O devices over the internet
15	Software shall allow the client applications to interact with multiple recorder servers simultaneously and allow the simultaneous display cameras from different recorders on the same monitor
16	The VMS shall support integration with different applications like different types of Sensors , Baggage Scanner, Perimeter Intruder Systems , RFID , Physical ACS etc
17	The client programs shall include end user client program, system management client program, browser-based client program and mobile client programs, atleast 10 concurrent client license to be provided which can later be expandable upto 20 User license without any charge.
18	The end user client program shall support multiple profiles for each user
19	Client applications shall provide an authentication mechanism, which verifies the validity of the user through the selected system management server
20	Client shall perform the following applications simultaneously without interfering with any of the Archive Server operations (Recording, Alarms, etc.) a. Live display of cameras and audio b. Live display of camera sequences c. Playback of video and audio d. Media search tools e. PTZ control f. Display and control of Maps g. Alarm management h. Digital I/O control
21	Client applications shall support any form of IP network connectivity including: LAN, WAN, VPN, Internet and Wireless
22	Client applications shall support IP Multicast (RTP) and Unicast (TCP or RTP) video and audio streaming as required depending on the network capabilities
23	Client application should support both dynamic and predefined Video display layouts, for example Fullscreen, 2x1, 2x2, 3x2, 3x3, 3x3+1 large , 4x2, 4x2+1 large , 4x3, 4x3+1 large , 4x3+2 large , 4x4 , 4x4+1 large , 5x5 , 6x5 + 1 large, 7x5 , 10x10 , 12x12 , 16x16 .etc.
24	Client application shall enable playback of audio along with video. The monitor shall enable the user to work with multiple Audio layouts containing collections of audio clips

25	Users shall be able to define and store their own layouts, which they will be able to recall later through a layout list. Each layout shall contain information about the dimensions and positions of all windows along with image filter data and data about the active profile
26	Client application shall enable playback of audio mixed from both live and recorded audio sources, allowing the user to control the volume of each source independently as well as mute them
27	Client application shall be able to control the playback with play, pause, forward and speed buttons
28	Client application shall allow operators to save bookmarks with description of the recorded and live video, audio and text data
29	Client application shall provide drag and drop facility for selection of the devices to be viewed in the viewing layout
30	Client application shall support Graphical Site Representation (Maps) functionality, where digital maps are used to represent the physical location of cameras and other devices throughout facility. Maps should have the capability to add the hyperlinks to create interlinked maps. It should allow the selection of any camera for display from the map
31	Client application shall support digital zoom on a fixed/PTZ camera's live and recorded video streams
32	Client application shall provide management and control over the system using a standard PC mouse, keyboard or CCTV keyboard. The client application shall support area zoom and click to center functions for PTZ cameras if supported by the specific camera driver. Area zoom zooms into the rectangle drawn by mouse and click to center means clicking anywhere on the PTZ camera view centers the camera to that position
33	Client application shall be able to control pan-tilt-zoom, iris, focus, presets and dome patterns of the PTZ camera
34	Software should provide the ability to play a minimum of 32 video channels in time sync with each other. Software shall support exporting a multichannel clip with video, audio and text channel data
35	Any user can share layouts and should be visible to all users of same profile
36	Ability to Autocrop each camera view.
37	Should support Virtual Matrix option to build video walls and video matrixes, the matrix can be created by having a separate display server for each four monitors in the matrix, as well as an operator console server to manage the display servers.

38	Ability to Define a Virtual camera that focuses in the part of camera view be it live or playback. using Virtual Cameras one can view chosen parts of the full recorded Camera View in a Separate Window. View Specific Area of interest in a virtual camera and choose per virtual camera for zooming, View , Aspect Ratio and resolution. Virtual cameras may overlap each other. Atleast 30 such Virtual camera can be made from one single camera view.
39	Shall have visualized Video intelligence for the Virtual camera to Auto Zoom and track an object .
40	The device Station should have various symbol options to user to understand if the Camera is in below Conditions : Normal, Recording , No Signal , Not in use , Connecting and No Connection.
41	The Graphic User Interface shall be very easy for the user to monitor and deter. The User interface in one window shall have at least the following : Menu, Profile Control, Device Tree , Data & Time settings , Activity Setting , Play back control , time slider, Camera Tour and control , Alarm List , Different Plugin options , Different tab controls for cameras.
42	<p>The camera toolbar shall be displayed when the mouse is moved over a camera or if a camera is selected with other means. If the mouse is not moved for some time, the camera toolbar disappears automatically.</p> <p>The camera toolbar shall contain atleast the following items.</p> <ul style="list-style-type: none"> • Camera settings control • Export control • Image print control • Camera closing and duplication control • Two way audio control • View or virtual zoom control • highlight control • Image Control plugin control • 360 camera de-warping control (In case of 360 Cameras) • Other toolbar plugins
43	Alarm Indications : The Alarm shall be easily indicated In the device tree, and in Profile Maps, the camera which is associated to an alarm shall be highlighted in yellow / Red Color.

44	Alarm Filtering Option shall be there . It shall possible to “silence” alarms for a desired time period Ranging from 5 Minutes till 24 Hours or more. This is useful if alarms are unintentionally active all the time, e.g., due to adverse environmental conditions such as heavy wind, rain or snowfall
45	Each camera view should have Image Control Plugin and each camera view can be configured individually as per the condition. The Image Control plugin has various options to adjust the camera image.
a	Option to turn the image to black and white image
b	Edge highlight filter
c	Histogram filter (a form of contrast optimization filter)
d	Noise reduction filter
e	Image sharpening filter
f	De-interlace filter
g	Image flip (flips image along horizontal Axis)
h	Image mirror (mirrors image along vertical axis)
i	Brightness adjustment slider
j	Contrast adjustment slider
46	The Software shall have an easy to use 3D calibration tool where 3D calibration objects are matched to the actual camera viewing scene. The calibration parameters include camera height, camera viewing angle and camera tilt angle. (Picture of 3 D Calibration tool of the Software to be attached with the tender document as proof of the same)
47	Evidence Export Solution - The Software shall be able to create, export and share Incident by making clips from multiple cameras with labels, descriptions and comments. The Clips shall be played simultaneously or sequentially in desired order to give wholistic veiw about the incident and the evidence. the systems should combine the video clips from multiple cameras collected together, and then edit them into a movie that contains authenticity checked material and detailed descriptions of what is being shown on the videos. The Evidence solution makes it very easy for the viewer to follow and understand exactly what happened. The exported video should be saved in SEF (Secure Export Format) for secure non tamper file system with Password key which can be set to 20 Characters. The Client application should support dual password mode for each user.

48	Advanced Activity Search - The software should have the capability to have intelligent and advanced activity /event search detection methods of last 25 such instances in a given period of time which will enable user to search a particular portion in the entire video where the incident / theft / bomb was kept within couple of minutes. The Video of such event can be directly exported from here itself for further process
49	Any Android or IOS smart phones can be converted as a camera and integrated with the system software as and when required and the footage to be recorded. Static IP for the devices shall be provided by end user if opted for.
50	The Mobile Client Version shall be available in Android and IOS.The Mobile client shall have the below Minimum Feature list : - Grid of 4 cameras visible when a tablet device is used in a landscape mode. - Swiping gestures can be used to switch between camera grids and also with individual cameras to get to full screen mode. - All system generated alarms. - Easy date and time search for video footage, still images can be sent via email as JPEG files by a single tap, its PTZ control includes manual control, pre-set positions and camera tours, I/O controls, such as doors and lights, can be controlled by the Mobile Client and sites can be easily configured on the road.

Video Analytics	
Sr.No	Required Parameter
1	The video analytics (VA) shall be of global repute and shall be an inbuilt solution from the VMS manufacturer where the video analytics software is included in the basic VMS installation package and work as a windows service.The VA should run in the same Recorder as that of the VMS. VA licence key to be part of VMS Licence key to avoid complexities of multiple licenses.
2	The Video Analytics (VA) shall be designed to provide Intelligent Video Analysis for 24/7 surveillance with support for 3rd party devices
3	The VA configurator shall work as an independent windows application
4	The VA shall allow each camera to have 40 detection zones that are polygonal with a variable number of vertices so that any shape can be supported. Detection zone can also be a line, which can have one or many segments. The VA shall be flexible to use Rule based Analytics in any fixed camera in the project and shall provide with floating license for the particular server.
5	The VA configurator shall have easy to use graphical user interface with live alarms list for easy parameter fine tuning and feedback.

6	The VA alarms shall be recorded in the VMS similarly like other alarms, for example motion detection, audio detection and digital input alarms.
7	The VMS shall store the VA alarm video and image files for export
8	The VA shall support video from any camera supported by the VMS.
9	The VA shall support cameras using any of the video compression formats H.264/MPEG4/MJPEG.
10	The VMS shall support scheduling so that that VA alarms can be enabled or disabled for a certain period of time. The VA software shall be able to run atleast 4 different types of analytics in one single camera.
11	Calibration The video analytics shall have an easy to use 3D calibration tool where 3D calibration objects are matched to the actual camera viewing scene. The calibration parameters include camera height, camera viewing angle and camera tilt angle. (Picture of 3 D Calibration tool of the Software to be attached with the tender document as proof of the same)
12	Presence The Presence filter detects when an object, person or vehicle is inside or crossing a zone or a line.
13	Camera Tampering Detects moving, defocusing or covering of the camera
14	Left Baggage/ Abandoned Baggage Detects and generates an alert highlighting Suspicious objects can be detected when carried into the scene and planted by a person as well as when dropped or thrown into the scene.
15	Enter and Exit Detection An “object entered” alarm is raised when an object crosses from the outside to the inside of a detection zone. Conversely, an “object exited” alarm is raised when an object crosses from the inside to the outside of a detection zone.
16	Stopping Detection Objects that are stopped inside a zone for longer than the defined amount of time will trigger the rule and raise an alarm.
17	Dwell detection Objects that dwell inside a zone for longer than the pre-defined amount of time will trigger the rule and raise an alarm.
18	Directional Detection Objects that travel in the configured direction (within the limits of the acceptance angle) through a zone or over a line trigger the rule and raise an alarm.
19	Object Classification

	VCA can perform object classification once the camera has been calibrated. Object classification is based on properties extracted from the object including object area and speed.
20	Objects Counting
	Up to 40 counters linked to the detection rules, provide counting of all detection objects.
21	Camera shake cancellation –object tracker works even if the camera is on a swaying pole

5.14 Passive and cabling Provisioning on the Junctions.

1. All Ethernet components which are to be connected with copper cable need to be connected with Toolless Field Termination Plug and this Field termination plug should be upgradable to IP54 rating and must be UL Listed. The plug should have option for colour coding for different services.
2. All outside plant copper patch cords should be double jacketed and must be treated with anti-rodent chemical.
3. All fiber patch cords should be armoured and of industrial type.
4. Cat 6 Cable should be double jacket with outer jacket HDPE and inner Jacket LSZH and should be mixed with anti-rodent chemical.
5. Fiber to be laid from ISP rack to service racks and fiber must be Armored Single Mode 12 core Fiber.
6. Service racks to be installed with DIN rail mountable LIU
7. All fiber connectors should be LC type only .
8. Joint enclosure should be supplied with 24 Fiber splice trays .
9. All passive cable and components should be of same OEM and should provide 25 years performance warranty

Minimum Technical Specifications required for the passive and cabling to enable the Junction connectivity

TECHNICAL SPECIFICATION FOR PASSIVE COMPONENTS	
General Specifications	Passive

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1	All Copper cable and components should be from the same OEM.OEM should submit ISO certificate for the manufacturing facilities related to all products involved in tender.	
2	All Passive Components should be RoHS (Restriction of Certain Hazardous Substances) compliant. Declaration to be provided for RoHS Compliance	
3	There should be 25 year extended performance warranty/Application Assurance for end -to-end channel.	
4	All the components should comply with their respective specifications stated below.	
A	Fiber Cable 12 cores Type & Construction:	
	Cable Class	12 Fiber Uni-Tube OS2 Armored
	Number of Fiber per tube	12
	Loose Tube	PBT
	Outer Sheath	HDPE - Black
	Tensile Strength	≥800 N
	Crush Resistance	≥2000 N
	Operating Temperature	-10°C to +70°C
	General Specs	All Fiber and copper cabling should be from same OEM and should have minimum 25 years of application warranty
B	DIN rail mountable LIU	
	Product type	12 Fiber Metallic DIN RAIL Mountable LIU
	Port Type	LC with 2 cable enteries on each side
	General Specs	All Fiber and copper cabling should be from same OEM and should have minimum 25 years of application warranty
C	LIU 12/24/48 port with Splice tray	
	material	Metal sliding style Loaded as per design for 12/24/48 Fiber

	ports	12/24/48
	Conector type	LC
	General Specs	All Fiber and copper cabling should be from same OEM and should have minimum 25 years of application warranty
D	Fiber Optic Joint Enclosure 24 /48 port	
	IP rating	IP68 and ergonomically design
	Storage basket	Integrated storage basket for uncut or expressed loose tubes
	Splice Tray	Hinged splice & splitter trays for access to any splice during and after installation
	No of Cores	24 and 48 as per requirement
	General Specs	All Fiber and copper cabling should be from same OEM and should have minimum 25 years of application warranty
E	Ruggedized Outdoor Single Mode Fiber Patch cord -Duplex (LC LC) with Stainless Steel Tape for stronger protection	
	Cable type	Ruggedized SM OS2 patch cord Tight buffered G.652D
	Cable Protection/Armor	Hellical Stainless steel tape over a buffered fiber surrounded by a layer of aramid and stainless steel mesh.
	Cable Jacket	Low Smoke Zero halogen /PVC
	General Specs	All Fiber and copper cabling should be from same OEM and should have minimum 20/25 years of application warranty
F	Fiber Pigtail LC	
	Cable type	Pigtail with semi-tight buffer PA/PBT, Ø 0.9 mm, yellow, singlemode G652.D 9/125 µm (OS1, OS2), length 1.5 m

	Type	Zirconia (ceramic) ferrule with a PC polished endface geometry, connector qualified in acc. with IEC 61753-1 for category U (uncontrolled environment). and qualified in acc. with IEC 61753-1
	General Specs	All Fiber and copper cabling should be from same OEM and should have minimum 20/25 years of application warranty
G	CAT6-Outdoor Double Jacket , Anti Rodent Cable (UTP Type)	
	Cable Outer jacket material:	HDPE Outer Sheath with anti rodent chemical
	Conductor diameter:	AWG 23
	Cable Inner jacket material:	LSZH
	Fire class	IEC-60332-1
	General Specs	All Fiber and copper cabling should be from same OEM and should have minimum 25 years of application warranty
H	Ruggedized Outdoor Patch cord - Cat6 (UTP)	
	Cable	Cat6 Patch cord should be Factory Terminated U/UTP Double Jacket
	Outer jacket	PE Outdoor type with anti rodent chemical
	Conductor diameter copper strand:	AWG 26/7
	Outer diameter	6 mm to 8 mm
	Color	Black
	Cable length [m]	1mtr,2mtr,3mtr and 5mtr (Should be available different lengths on request)
	General Specs	All Fiber and copper cabling should be from same OEM and should have minimum 25 years of application warranty

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I	UTP Field Termination Connector IP20	
	Connection type	Toolless Insulation Displacement Connection
	Category	Cat 6 UTP
	IP Class	IP 20 rated
	Certification	UL Listed
	color Coding	Should have option for visual color coding
	General Specs	All Fiber and copper cabling should be from same OEM and should have minimum 25 years of application warranty
J	Information Outlet	
	Connection type	Toolless IDC type outlet
	material	Low Smoke Zero halogen
	Category	Cat 6 UTP
	Certification	3P/ETL Verified in channel and should be in latest program of testing authorities and certificate should be available on third party website
	mating cycles	min 750 mating cycles
	General Specs	All Fiber and copper cabling should be from same OEM and should have minimum 25 years of application warranty
K	Patch Panel Unloaded	
	Ports	24 port
	Type	Unloaded
	Design	Should have Zig Zag/Straight/Sideways orientation
	Certification	UL Listed
	General Specs	All Fiber and copper cabling should be from same OEM and should have minimum 25 years of application warranty

5.15 Bandwidth Provisioning

The network bandwidth need to be facilitated at the junction to the nearest POP of the Selected ISP it may be required for upgrading the Junction infrastructure, this bandwidth will be required for the last mile connectivity to ICCC, to meet the requirements of the City Traffic, The network & bandwidth should meet following requirements:

- Authority may order an increase/decrease/termination/withdrawal in bandwidth, which shall be take into account.
- The network should be capable of providing Bandwidth on Demand for planned as well as for unplanned activities.

Minimum Technical Specifications required to enable the Junction connectivity to ICCC.

- The bandwidth must be provisioned on Optical Fiber Media. No other last mile media type is acceptable.
- Latency from point A to point B should not exceed 20 ms.
- The bandwidth supplied should be symmetric, dedicated 1:1 with 100% throughput.
- Up time guarantee must be 99.5 %
- MSI must deliver this bandwidth on a fiber optic cable network at the respective locations.
- All costs to connect the links to last mile node has to be borne by MSI. DSCCL will not pay or reimburse any last mile of extra work cost.

5.16 Integration with Existing ICCC.

The MSI need to Install and integrate all application at existing ITMS and ICCC at Indore.

Connectivity from local NOC to Traffic junctions need to be provisioned by MSI as per requirement.

5.17 Project Implementation Schedule, Deliverables and Payment Terms

5.17.1 Project Implementation Schedule and Deliverables Payment Schedule

T = 14 Days from signing of contract

#	Milestones	Deliverables	Timelines (in months)
1	Project Implementation Phase		T + 6 months
1.1	Project Inception Report	Detailed site survey report including infrastructure requirement analysis, hardware deployment plan, recommended action plan to address the gaps, budget estimates for addressing the gaps uncovered during the survey, phase wise location distribution etc. Detailed Project Plan including resource deployment, Communication plan, Risk management plan, Information Security and Business Continuity, Sensitization & Training Plan, Operations management plan etc.	T + 0.5 months
1.2	Requirement Study <ul style="list-style-type: none"> Integrated Command and Control Center and City Surveillance City IT Network Infrastructure Traffic Management System (TMS) ATCS 	Architecture and design for ITMS, City IT Network and Data Centre, Network Architecture, Security architecture etc. Submission of FRS, SRS including Solution Architecture, Application Design Documents (HLD & LLD) of the proposed system Integration report for external applications	T + 1 months
1.3	Hardware Delivery & commissioning ITMS Design, installation, commissioning including system software, & operationalization	1. Site Completion/readiness Report 2. Delivery Acceptance Reports from ISCDL/authorized entity 3. Installation & Commissioning Reports 4. Software Licenses details	T +5 months

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#	Milestones	Deliverables	Timelines (in months)
	Software at Integrated Command and Control Centre		
1.4	Go-Live ITMS – Supply, installation, commissioning, training and operationalization of TSM components (ATCS, ANPR, RLVD,) at 100% of total identified locations	<ol style="list-style-type: none"> 1. Site Completion/readiness Report 2. Delivery Acceptance Reports from ISCDL/authorized entity 3. Installation & Commissioning Reports 4. Software Licenses details 5. UAT/FAT and Go Live Certificate from ISCDL/authorized entity 6. Training Content & Completion Certificate 7. Security Audit Certificate from Cert-In/STQC for Applications 	T1 = T+6 months
2	Project Operation & Maintenance Phase		T1 + 84 months
2.1	Operation & Maintenance	<ul style="list-style-type: none"> • Monthly & Quarterly SLA Reports • Reports 	T1 + 84 months

Based on findings of the site survey activity done by MSI, MSI may propose a change in the number of sites or individual units to be deployed in each phase as well as overall scope and a consequent change in phasing. ISCDL also retains the right to suo-moto change the number of sites or individual units to be deployed for each scope item. MSI should complete all the activities within the defined timelines as indicated above. The timeline will be reviewed regularly during implementation phase and may be extended in case ISCDL feels that extension in a particular Request Order/Integration or any track is imperative, for the reason beyond the control of the bidder. In all such cases ISCDL's decision shall be final and binding. MSI will be eligible for the payment based on the completion of activities and approval of the relevant deliverables.

5.17.2 Payment Schedule

#	Milestones	Timelines	Payment
1.	Inception Report + Requirement study	T + 1 Months	10 % of Capex value
2.	Hardware Delivery & commissioning ITMS	T + 5 Months	40% of Capex value
3.	Go Live	T + 6 Months	50 % of capex value
4.	Project Operations & Maintenance phase for a period of 84 months from the date of Final Go Live	T1 + 84 Months	OPEX will be paid in twenty (28) equal quarterly instalments spread across 7 years Post Final Go-Live

*T = 14 days from Date of Signing of Contract

Note 1: If successful bidder requests for Mobilization advance, following conditions shall be applicable –

- a. Mobilization advance can be maximum of 10% of capex value
- b. Mobilization advance shall be released only after receipt of Bank Guarantee of the requested amount
- c. Mobilization advance shall be interest bearing and PLR rate of interest shall be payable to ISCDL by the successful bidder

Note 2:

- a. All payments to the Systems Integrator shall be made upon submission of invoices along with necessary approval certificates from ISCDL
- b. The above payments are subject to meeting of SLA's failing which the appropriate deductions as mentioned in the Volume III of this RFP

6 Detailed Scope of Work and Considerations

6.1 Inception Phase

MSI will be responsible for preparation of detailed project plan. The plan shall address at the minimum the following:

- i. Define an organized set of activities for the project and identify the interdependence between them.
- ii. Resource planning and loading for each phase/activity. This must also indicate where each resource would be based during that phase, i.e. onsite at the ISCDL office or off site at MSI premises.
- iii. Establish and measure resource assignments and responsibilities
- iv. Highlight the milestones and associated risks
- v. Communicate the project plan to stakeholders with meaningful reports.
- vi. Measure project deadlines and performance objectives.
- vii. Project Progress Reporting. During the implementation of the project, MSI should present weekly reports. This report will be presented in the steering committee meeting to ISCDL. The report should contain at the minimum the under mentioned:
 - a. Results accomplished during the period (weekly)
 - b. Cumulative deviations from the schedule date as specified in the finalized Project Plan
 - c. Corrective actions to be taken to return to planned schedule of progress
 - d. Plan for the next week
 - e. Proposed revision to planned schedule provided such revision is necessitated by reasons beyond the control of MSI
 - f. Support needed
 - g. Highlights/lowlights
 - h. Issues/Concerns
 - i. Risks/Show stoppers along with mitigation
- viii. Identify the activities that require the participation of client personnel (including ISCDL, the Program Management Unit etc.) and communicate their time requirements and schedule early enough to ensure their full participation at the required time.

6.2 Requirement Phase

MSI must perform the detailed assessment of the business requirements and IT Solution requirements as mentioned in this RFP. Based on the understanding and its own individual assessment, MSI shall develop & finalize the System Requirement Specifications (SRS) in consultation with ISCDL and its representatives. While doing so, MSI at least is expected to do following:

- a. MSI shall conduct a detailed survey and prepare a gap analysis report, detailed

survey report of the physical and field infrastructure requirements. MSI shall duly assist the department in preparing an action plan to address the gaps.

- b. MSI shall study and revalidate the requirements given in the RFP with ISCDL and submit as an exhaustive FRS document. MSI shall develop the FRS and SRS documents.
- c. MSI shall develop and follow standardized template for requirements capturing and system documentation.
- d. MSI must maintain traceability matrix from SRS stage for the entire implementation.
- e. MSI must get the sign off from user groups formed by ISCDL.
- f. For all the discussion with ISCDL team, MSI shall be required to be present at ISCDL office with the requisite team members.
- g. Prior to starting the site clearance, MSI shall carry out survey of field locations as determined by ISCDL.
- h. The infrastructure of existing traffic signal and other street ICT infrastructure may need to be dismantled and replaced with the new systems which are proposed and required under the scope of the project. The infrastructure such as poles, cantilevers, cabling, aspects etc. should be reused to derive economies for the project with prior approval of ISCDL. The dismantled infrastructure shall be delivered at the ISCDL designated location without damage at no extra cost.
- i. MSI shall directly interact with electricity boards for provision of mains power supply at all desired locations for field solution. ISCDL shall facilitate the same. The recurring electricity charges will be borne by ISCDL as per actual consumption.

6.3 Design Phase

MSI shall build the solution as per the Design Considerations detailed in Annexure – IV. The solution proposed by MSI should comply with the design considerations requirements as mentioned therein.

6.4 Development Phase

MSI shall carefully consider the scope of work and provide a solution that best meets the project's requirements. Considering the scope set in this RFP, MSI shall carefully consider the solutions it proposes and explicitly mention the same in the technical proposal. The implementation of the application software will follow the procedure mentioned below:

- a. Software Products (Configuration and Customization): In case MSI proposes software products the following need to be adhered:
 - i. MSI will be responsible for supplying the application and licenses of related software products and installing the same so as to meet project requirements.
 - ii. MSI shall have provision for procurement of licenses in a staggered manner as per the actual requirement of the project.
 - iii. MSI shall perform periodic audits to measure license compliance against the number of valid End User software licenses consistent with the terms and conditions of license agreements, volume purchase agreements, and other

mutually agreed upon licensed software terms and conditions. MSI shall report any exceptions to license terms and conditions at the right time to ISCDL. However, the responsibility of license compliance solely lies with MSI. Any financial penalty imposed on ISCDL during the contract period due to license non-compliance shall be borne by MSI.

- iv. MSI shall also supply any other tools & accessories required to make the integrated solution complete as per requirements. For the integrated solution, MSI shall supply:
 - a) Software & licenses.
 - b) Supply tools, accessories, documentation and provide a list of the same. Tools and accessories shall be part of the solution.
 - c) System Documentation: System Documentation both in hard copy and soft copy to be supplied along with licenses and shall include but not limited to following. Documentation to be maintained, updated and submitted to ISCDL regularly :
 - Functional Requirement Specification (FRS)
 - High level design of whole system
 - Low Level design for whole system / Module design level
 - System Requirements Specifications (SRS)
 - Any other explanatory notes about system
 - Traceability matrix
 - Technical and product related manuals
 - Installation guides
 - User manuals
 - System administrator manuals
 - Toolkit guides and troubleshooting guides
 - Other documents as prescribed by ISCDL
 - Quality assurance procedures
 - Change management histories
 - Version control data
 - SOPs, procedures, policies, processes, etc. developed for ISCDL
 - Programs :
 - Entire source codes as applicable
 - All programs must have explanatory notes for understanding
 - Version control mechanism
 - All old versions to be maintained
 - Test Environment :
 - Detailed Test methodology document

- Module level testing
- Overall System Testing
- Acceptance test cases

(These documents need to be updated after each phase of project and to be maintained updated during entire project duration. The entire documentation will be the property of ISCDL.)

6.5 Integration Phase

The Integrated Command and control Centre should be integrated with feeds of all tracks/component through deployed under this Project. MSI shall provide the testing strategy including traceability matrix, test cases and shall conduct the testing of various components of the software developed/customized and the solution as a whole. The testing should be comprehensive and should be done at each stage of development and implementation.

#	Solution to be integrated	Integration requirements
2	Intelligent Traffic Management System	ICC will be required to integrate Traffic Management System to get all kinds of feeds. All the information received at the ITMS will also go into the Analytical layer which will help city in better planning and running of operations. ITMS should also be able to trigger the commands / alerts (if required) to the respective department.

6.6 Go-Live

- MSI shall prepare and agree with ISCDL, the detailed plan for Go-Live (in-line with ISCDL’s implementation plan as mentioned in RFP).
- MSI shall define and agree with ISCDL, the criteria for Go-Live.
- MSI shall submit signed-off UAT report (issue closure report) ensuring all issues raised during UAT are being resolved prior to Go-Live.
- MSI shall ensure that Go –Live criteria as mentioned in User acceptance testing of Project is met and MSI needs to take approval from ISCDL team on the same.
- Go-live of the application shall be done as per the finalized and agreed upon Go-Live plan.

6.7 Operations and Maintenance

MSI will operate and maintain all the components of the ITMS for a period of Seven (7) years after Go-Live date. During O&M phase, MSI shall ensure that service levels are monitored on continuous basis; service levels are met and are reported to ISCDL. After Go-Live, if any system/sub-system/appliance that is deployed during the O&M phase must be added in the System only after proper induction procedures are followed including hardening and security testing. MSI needs to implement suitable Performance Improvement Process (PIP) in the project.

PIP program applies to the processes of ITMS project. MSI need to submit its detailed approach for PIP in its technical proposal. Every process and procedure implemented in this project must be reviewed and updated by MSI at least on annual basis from the Go-Live Date. All the manpower engaged for O&M support of the project should be citizens of India. MSI will ensure that at no time shall any data of ITMS System be ported outside the geographical limits of the country. Some broad details of O&M activities are mentioned below:

6.7.1 Applications Support and Maintenance

Application support includes, but not limited to, production monitoring, troubleshooting and addressing the functionality, availability and performance issues, implementing the system change requests etc. The MSI shall keep the application software in good working order; perform changes and upgrades to applications as requested by the ISCDL team. All tickets related to any issue/complaint/observation about the system shall be maintained in an ITIL compliant comprehensive ticketing solution. Key activities to be performed by MSI in the application support phase are as follows:

a. Compliance to SLA

MSI shall ensure compliance to SLAs as indicated in this RFP and any upgrades/major changes to the software shall be accordingly planned by MSI ensuring the SLA requirements are met at no additional cost to the ISCDL.

b. Annual Technology Support

MSI shall be responsible for arranging for annual technology support for the OEM products to ISCDL provided by respective OEMs during the entire O&M phase.

c. Application Software Maintenance

- i. MSI shall provide unlimited support through onsite team/telephone/Fax/E-mail/Video Conferencing/installation visit as required
- ii. MSI shall address all the errors/bugs/gaps in the functionality in the solution implemented by the MSI (vis-à-vis the FRS and SRS signed off) at no additional cost during the O&M phase.
- iii. All patches and upgrades from OEMs shall be implemented by the MSI ensuring customization done in the solution as per the ISCDL's requirements are applied. Technical upgrade of the installation to the new version, as and when required, shall be done by the MSI. Any version upgrade of the software / tool / appliance by MSI to be done after taking prior approval of ISCDL and after submitting impact assessment of such upgrade.
- iv. Any changes/upgrades to the software performed during the support phase shall subject to the comprehensive and integrated testing by the MSI to ensure that the changes implemented in the system meets the specified requirements and doesn't impact any other function of the system. Release management for application software will also require ISCDL's approval. A detailed process in this regard will be finalized by MSI in consultation with ISCDL.

- v. Issue log for the errors and bugs identified in the solution and any change done in the solution shall be maintained by the MSI and periodically submitted to the ISCDL.
 - vi. MSI, at least on a monthly basis, will inform ISCDL about any new updates/upgrades available for all software components of the solution along with a detailed action report.
 - vii. In case of critical security patches/alerts, the MSI shall inform about the same immediately along with his recommendations. The report shall contain MSI's recommendations on update/upgrade, benefits, impact analysis etc. The MSI shall need to execute updates/upgrades through formal change management process and update all documentations and Knowledge databases etc. For updates and upgrades, MSI will carry it out free of cost by following defined process.
- d. Problem identification and Resolution
- i. Errors and bugs that persist for a long time, impact a wider range of users and is difficult to resolve becomes a problem. MSI shall identify and resolve all the application problems in the identified solution (e.g. system malfunctions, performance problems and data corruption etc.).
 - ii. Monthly report on problem identified and resolved would be submitted to ISCDL along with the recommended resolution.
- e. Change and Version Control
- All planned or emergency changes to any component of the system shall be through the approved Change Management process. The MSI needs to follow all such processes (based on industry ITSM framework). For any change, MSI shall ensure:
- i. Detailed impact analysis
 - ii. Change plan with Roll back plans
 - iii. Appropriate communication on change required has taken place
 - iv. Proper approvals have been received
 - v. Schedules have been adjusted to minimize impact on the production environment
 - vi. All associated documentations are updated post stabilization of the change
 - vii. Version control maintained for software changes
- The MSI shall define the Software Change Management and Version control process. For any changes to the solution, MSI has to prepare detailed documentation including proposed changes, impact to the system in terms of functional outcomes/additional features added to the system etc. MSI shall ensure that software and hardware version control is done for entire duration of MSI's contract
- f. Maintain configuration information
- MSI shall maintain version control and configuration information for application software and any system documentation.

g. Training

MSI shall provide training to ISCDL personnel whenever there is any change in the functionality. Training plan has to be mutually decided with ISCDL.

h. Maintain System documentation

MSI shall maintain at least the following minimum documents with respect to the ICC System:

- i. High level design of whole system
- ii. Low Level design for whole system / Module design level
- iii. System requirements Specifications (SRS)
- iv. Any other explanatory notes about system
- v. Traceability matrix
- vi. Compilation environment

MSI shall also ensure updation of documentation of software system ensuring that:

- i. Source code is documented
 - ii. Functional specifications are documented
 - iii. Application documentation is updated to reflect on-going maintenance and
 - iv. enhancements including FRS and SRS, in accordance with the defined standards
 - v. User manuals and training manuals are updated to reflect on-going
 - vi. changes/enhancements
 - vii. Standard practices are adopted and followed in respect of version control and management.
- i. All the project documents need to follow version control mechanism. MSI will be required to keep all project documentation updated and should ensure in case of any change, the project documents are updated and submitted to ISCDL by the end of next quarter.
- j. For application support MSI shall keep dedicated software support team to be based at MSI location that will single point of contact for resolution of all application related issues. This team will receive all the application related tickets/incidents and will resolve them. In its technical proposal MSI need to provide the proposed team structure of application support including number of team members proposed to be deployed along with roles and skills of each such member. Application support team shall be employees of MSI
- k. Any software changes required due to problems/bugs in the developed software/application will not be considered under change control. The MSI will have to modify the software/ application free of cost. This may lead to enhancements/customizations and the same needs to be implemented by the MSI at no extra cost.
- l. Any additional changes required would follow the Change Control Procedure.

ISCDL may engage an independent agency to validate the estimates submitted by the MSI. The inputs of such an agency would be taken as the final estimate for efforts required. MSI to propose the cost of such changes in terms of man month rate basis and in terms of Function point/Work Breakdown Structure (WBS) basis in the proposal.

6.7.2 ICT Infrastructure Support and Maintenance

ICT infrastructure includes servers, storages, back up, networking, load balancers, security equipment, operating systems, database, enterprise management system, help desk system and other related ICT infra required for running and operating the envisaged system. MSI shall define, develop, implement and adhere to IT Service Management (ITSM) processes aligned to ITIL framework for all the IT Services defined and managed as part of this project.

6.7.3 Warranty support

- a. MSI shall provide comprehensive and on-site warranty for 7 years from the date of Go-Live for the infrastructure deployed on the project. MSI need to have OEM support for these components and documentation in this regard need to be submitted to ISCDL on annual basis.
- b. MSI shall provide the comprehensive & onsite manufacturer's warranty in respect of proper design, quality and workmanship of all hardware, equipment, accessories etc. covered by the RFP. MSI must warrant all hardware, equipment, accessories, spare parts, software etc. procured and implemented as per this RFP against any manufacturing defects during the warranty period.
- c. MSI shall provide the performance warranty in respect of performance of the installed hardware and software to meet the performance requirements and service levels in the RFP.
- d. MSI is responsible for sizing and procuring the necessary hardware and software licenses as per the performance requirements provided in the RFP. During the warranty period MSI shall replace or augment or procure higher-level new equipment or additional licenses/hardware at no additional cost to the ISCDL in case the procured hardware or software is not enough or is undersized to meet the service levels and the project requirements.
- e. During the warranty period MSI shall maintain the systems and repair/replace at the installed site, at no charge to ISCDL, all defective components that are brought to the MSI's notice.
- f. The MSI shall carry out Preventive Maintenance (PM) of all hardware and testing for virus, if any, and should maintain proper records at each site for such PM. The PM should be carried out at least once in six months as per checklist and for components agreed with ISCDL.
- g. The MSI shall carry out Corrective Maintenance for maintenance/troubleshooting of supplied hardware/ software and support infrastructure problem including network (active/passive) equipment, security and rectification of the same. The MSI shall also maintain complete documentation of problems, isolation, cause and rectification procedures for building knowledge base for the known problems in

centralized repository, accessible to ISCDL team as well.

- h. MSI shall monitor warranties to check adherence to preventive and repair maintenance terms and conditions.
- i. The MSI shall ensure that the warranty complies with the agreed technical standards, security requirements, operating procedures, and recovery procedures.
 - i. MSI shall have to stock and provide adequate onsite and offsite spare parts and spare component to ensure that the uptime commitment as per SLA is met.
 - ii. Any component that is reported to be down on a given date should be either fully repaired or replaced by temporary substitute (of equivalent configuration) within the time frame indicated in the Service Level Agreement (SLA).
 - iii. The MSI shall introduce a comprehensive Assets Management process & appropriate tool to manage the entire lifecycle of every component of C4 system.

a. Maintenance of ICT Infrastructure ITMS

MSI need to deploy requisite mix of L1 and L2 resources (on 24X7 basis) for management of entire ITMS/ITMS System. All resources deployed in the project should be employees of MSI and be Indian citizens. All the L1 and L2 resources proposed for the project need to be dedicated for the project. Any change in the team once deployed will require approval from ISCDL. It is expected that resources have proven track record and reliability. Considering the criticality of the project, ISCDL may ask for security verification (Police verification) of every resource deployed on the project and MSI need to comply the same before deployment of the resource at the project. At all times, the MSI need to maintain the details of resources deployed for the project to ISCDL and keep the same updated. A detailed process in this regard will be finalised between ISCDL and MSI. The MSI shall maintain an attendance register for the resources deployed Attendance details of the resources deployed also need to be shared with ISCDL on monthly basis. ISCDL reserves the right to interview resources deployed for Operations and maintenance and assess the suitability of the resource for the role. In case a resource is not found suitable, MSI will change the resource on request of ISCDL. MSI shall comply with this.

The scope of work for infrastructure and maintenance includes the following:

- i. ITMS operations to be in compliance with industry leading ITSM frameworks like ITIL, ISO
- ii. Ensure compliance to relevant SLA's
- iii. 24x7 monitoring & management of availability & security of the infrastructure and assets
- iv. Perform regular hardening, patch management, testing and installation of software updates issued by OEM/vendors from time to time after following agreed process

- v. Ensure overall security – ensure installation and management of every security component at every layer including physical security
- vi. Prepare documentation/policies required for certifications included in the scope of work
- vii. Preventive maintenance plan for every quarter
- viii. Performance tuning of system as required
- ix. Design and maintain Policies and Standard Operating Procedures
- x. User access management
- xi. Other activities as defined/to meet the project objectives
- xii. Updation of all Documentation.

During operations phase the MSI needs to submit proof of renewal of support for all IT infrastructure products and other system software's for whom it is mandated to have OEM support.

This needs to be submitted on an annual basis and needs to be verified before release of 2nd quarter payment of each year.

b. System Maintenance and Management

- i. MSI shall be responsible for tasks including but not limited to setting up servers, configuring and apportioning storage space, account management, performing periodic backup of data and automating reporting tasks, and executing hardware and software updates when necessary. It shall be noted that the activities performed by the MSI may also be reviewed by ISCDL.
- ii. MSI shall provision skilled and experienced manpower resources to administer and manage the entire system of ITMS.
- iii. On an ongoing basis, MSI shall be responsible for troubleshooting issues in the IT infrastructure solution to determine the areas where fixes are required and ensuring resolution of the same.
- iv. MSI shall be responsible for identification, diagnosis and resolution of problem areas pertaining to the IT Infrastructure and maintaining the defined SLA levels.
- v. MSI shall implement and maintain standard operating procedures for the maintenance of the IT infrastructure based on the policies formulated in discussion with ISCDL and based on the industry best practices/frameworks. MSI shall also create and maintain adequate documentation/checklists for the same.
- vi. MSI shall be responsible for managing the user names, roles and passwords of all the relevant subsystems, including, but not limited to servers, other devices, etc. MSI shall be required to set up the directory server. Logs relating to access of system by administrators shall also be kept and shall be made available to NRDA on need basis.
- vii. MSI shall implement a password change mechanism in accordance with the security policy formulated in discussion with ISCDL and based on the industry best practices/frameworks like ISO 27001, ISO 20000 etc.

- viii. The administrators shall also be required to have experience in latest technologies so as to provision the existing and applicable infrastructure on a requirement based scenario.

c. System Administration

- i. 24*7*365 monitoring and management of the IT Infrastructure.
- ii. MSI shall also ensure proper configuration of server parameters and performance tuning on regular basis. MSI shall be the single point of accountability for all hardware maintenance and support the ICT infrastructure. It should be noted that the activities performed by the MSI may be reviewed by ISCDL.
- iii. MSI shall be responsible for operating system administration, including but not limited to management of users, processes, preventive maintenance and management of upgrades including updates, upgrades and patches to ensure that the system is properly updated.
- iv. MSI shall also be responsible for installation and re-installation of the hardware(s) as well as the software(s) in the event of system crash/failures.
- v. MSI shall also be responsible for proactive monitoring of the applications hosted
- vi. MSI shall appoint system administrators to regularly monitor and maintain a log of the monitoring of servers to ensure their availability to ISCDL at all times.
- vii. ISCDL shall undertake regular analysis of events and logs generated in all the sub systems including but not limited to servers, operating systems etc. The system administrators shall undertake actions in accordance with the results of the log analysis. The system administrators shall also ensure that the logs are backed up and truncated at regular intervals. MSI shall refer to CERT-In Guidelines so as to ensure their alignment with the practices followed.
- viii. The system administrators shall adopt a defined process for change and configuration management in the areas including, but not limited to, changes in servers, operating system, applying patches, etc.
- ix. The system administrators shall provide hardening of servers in line with the defined security policies. Validation of hardening configuration will be carried out quarterly and deviations must be tracked through SLA reporting
- x. The system administrators shall provide integration and user support on all supported servers, data storage systems etc.
- xi. The system administrators shall be required to trouble shoot problems with web services, application software, server relationship issues and overall aspects of a server environment like managing and monitoring server configuration, performance and activity of all servers.
- xii. The system administrators should be responsible for documentation regarding configuration of all servers, IT Infrastructure etc.
- xiii. The system administrators shall be responsible for managing the trouble

tickets, diagnosis of the problems, reporting, managing escalation, and ensuring rectification of server problems as prescribed in Service Level Agreement.

- xiv. The administrators will also be required to have experience in latest technologies so as to provision the existing and applicable infrastructure on a requirement based scenario.

d. Network monitoring

- i. MSI shall provide services for management of network environment to maintain performance at optimum levels on a 24 x 7 basis. It should be noted that the activities performed by the MSI may be reviewed by ISCDL.
- ii. MSI shall be responsible for creating and modifying VLAN, assignment of ports to appropriate applications and segmentation of traffic.
- iii. MSI shall also be responsible for break fix maintenance of the LAN cabling MSI shall also provide network related support and will coordinate with connectivity service providers of ISCDL /other agencies who are terminating their network for access of system.

e. Other Activities

- i. MSI shall ensure that it prepares configuration manual for OS, appliances, middleware, all tool, servers/devices and all equipment's and the same need to be submitted to ISCDL, any changes in the configuration manual need to be approved by ISCDL. Configuration manual to be updated periodically.
- ii. MSI shall maintain data regarding entitlement for software upgrades, enhancements, refreshes, replacements and maintenance.
- iii. If the Operating System or additional copies of Operating System are required to be installed/reinstalled/un-installed, the same should be done as part of O&M.
- iv. MSI should carry out any requisite adjustments/changes in the configuration for implementing different versions of Application Software.
- v. Updates/Upgrades/New releases/new versions: The MSI shall provide from time to time the Updates/Upgrades/new releases/new versions of the software and operating systems as required. The MSI should provide free upgrades, updates & patches of the software and tools to ISCDL as and when released by OEM.
- vi. MSI shall provide patches to the software as part of IT infrastructure, operating system, databases and other applications.
- vii. Software License Management: The MSI shall provide for software license management and control. MSI shall maintain data regarding entitlement for software updates, enhancements, refreshes, replacements, and maintenance.
- viii. Data backup/recovery management services
- ix. All other activities required to meet the project requirements and service

levels.

- x. It is responsibility of the MSI to scale up the Operations & Maintenance (O&M) team as and when required to ensure smooth project execution throughout the project duration.

6.7.4 Compliance to SLA

- i. MSI shall ensure compliance to uptime and performance requirements of project solution as indicated in the SLA table of RFP and any upgrades/major changes to the ITMS System shall be accordingly planned by MSI for ensuring the SLA requirements.
- ii. MSI shall be responsible for measurement of the SLAs at the ITMS System level as well as at the user level with the help of the enterprise monitoring tool on a periodic basis.
- iii. Reports for SLA measurement must be produced ISCDL officials as per the project requirements.

6.8 Manpower Deployment

MSI shall deploy Manpower during implementation and O&M phases. The deployed resource shall report to ISCDL and work closely with Program Management Office of the project. Following are the minimum resources required to be deployed in the Project, however MSI may deploy additional resources based on the need of the Project and to meet the defined SLAs in this RFP:

#	Type of Resource	Minimum Quantity	Minimum Deployment during Implementation phase	Minimum Deployment during O & M phase
1.	Team Leader-cum-Program Manager	1	100%	100%
2.	Solution Architect	1	80%	Onsite Support to Project team on need basis
3.	ITMS Expert	1	50%	Onsite Support to Project team on need basis
4.	Security Expert	1	60%	Onsite Support to Project team on need basis
5.	Network Administrator	1	50%	100%

Apart from the above mentioned manpower, MSI is required to provide suitable manpower to monitor the data feeds at command Centre and support ISCDL in operationalization of the project. Total number of operators required for the project is 8 in three shifts. ISCDL reserves the right to increase or decrease the number of operators. The exact role of these personnel and their responsibilities would be defined and monitored by ISCDL and respective departmental personnel. MSI shall

be required to provide such manpower meeting following requirements:

1. All such manpower shall be minimum graduate pass
2. All such manpower shall be without any criminal background / record.
3. ISCDL reserves the right to carry out background check of the personnel proposed on the Project for verification of criminal record, at the beginning of deployment or during deployment.
4. MSI shall have to replace any person, if not found suitable for the job.
5. All the manpower shall have to undergo training from MSI for at least 15 working days on the working of project. Training should also cover dos & don'ts and will have few sessions from ISCDL officers on right approaches for monitoring the feeds & providing feedback to ISCDL, Traffic Police and other associated government agencies.
6. Each person shall have to undergo compulsory 1 day training every month
7. Operational Manpower shall work in 3 shifts, with no person being made to see the feeds for more than 8 hours at a stretch.

Detail operational guideline document, standard operating procedure, governance and oversight plan shall be prepared by MSI during implementation which shall specify detail responsibilities of these resources and their do's & don'ts.

The supervisors required for operationalization of the project will be provided by ISCDL, as per requirements.

6.9 Exit Management

- a. This sets out the provisions, which will apply on expiry or termination of the Master Service Agreement, the Project Implementation, Operation and Management SLA.
- b. In the case of termination of the Project Implementation and/or Operation and Management, the Parties shall agree at that time whether, and if so during what period, the provisions of this Schedule shall apply.
- c. The Parties shall ensure that their respective associated entities carry out their respective obligations set out in this Exit Management Schedule.

6.9.1 Cooperation and Provision of Information

During the exit management period:

- a. MSI will allow the ISCDL or its nominated agency access to information reasonably required to define the then current mode of operation associated with the provision of the services to enable the ISCDL to assess the existing services being delivered;
- b. Promptly on reasonable request by the ISCDL, MSI shall provide access to and copies of all information held or controlled by them which they have prepared or maintained in accordance with this agreement relating to any material aspect of the services (whether provided by MSI or sub-contractors appointed by MSI). The ISCDL shall be entitled to copy of all such information. Such information shall include details pertaining to the services rendered and other performance data.

MSI shall permit the ISCDL or its nominated agencies to have reasonable access to its employees and facilities, to understand the methods of delivery of the services employed by MSI and to assist appropriate knowledge transfer.

6.9.2 Confidential Information, Security and Data

- a. MSI will promptly on the commencement of the exit management period supply to the ISCDL or its nominated agency the following:
 - information relating to the current services rendered and customer and performance data relating to the performance of sub-contractors in relation to the services;
 - documentation relating to Intellectual Property Rights;
 - documentation relating to sub-contractors;
 - all current and updated data as is reasonably required for purposes of ISCDL or its nominated agencies transitioning the services to its Replacement MSI in a readily available format nominated by the ISCDL, its nominated agency;
 - all other information (including but not limited to documents, records and agreements) relating to the services reasonably necessary to enable ISCDL or its nominated agencies, or its Replacement MSI to carry out due diligence in order to transition the provision of the Services to ISCDL or its nominated agencies, or its Replacement MSI (as the case may be).
- b. Before the expiry of the exit management period, MSI shall deliver to the ISCDL or its nominated agency all new or up-dated materials from the categories set out in Schedule above and shall not retain any copies thereof, except that MSI shall be permitted to retain one copy of such materials for archival purposes only.

6.9.3 Transfer of Certain Agreements

On request by the ISCDL or its nominated agency MSI shall effect such assignments, transfers, licenses and sub-licenses ISCDL, or its Replacement MSI in relation to any equipment lease, maintenance or service provision agreement between MSI and third party lessors, vendors, and which are related to the services and reasonably necessary for the carrying out of replacement services by the ISCDL or its nominated agency or its Replacement MSI.

6.9.4 General Obligations of MSI

- a. MSI shall provide all such information as may reasonably be necessary to effect as seamless a handover as practicable in the circumstances to the ISCDL or its nominated agency or its Replacement MSI and which MSI has in its possession or control at any time during the exit management period.
- b. For the purposes of this Schedule, anything in the possession or control of any MSI, associated entity, or sub-contractor is deemed to be in the possession or control of MSI.
- c. MSI shall commit adequate resources to comply with its obligations under this Exit Management Schedule.

6.9.5 Exit Management Plan

- a. MSI shall provide the ISCDL or its nominated agency with a recommended exit management plan ("Exit Management Plan") which shall deal with at least the following aspects of exit management in relation to the MSA as a whole and in relation to the Project Implementation, and the Operation and Management SLA.
 - A detailed program of the transfer process that could be used in conjunction with a Replacement MSI including details of the means to be used to ensure continuing provision of the services throughout the transfer process or until the cessation of the services and of the management structure to be used during the transfer;
 - plans for the communication with such of MSI's sub-contractors, staff, suppliers, customers and any related third party as are necessary to avoid any material detrimental impact on the ISCDL's operations as a result of undertaking the transfer;
 - (if applicable) proposed arrangements for the segregation of MSI's networks from the networks employed by ISCDL and identification of specific security tasks necessary at termination;
 - Plans for provision of contingent support to ISCDL, and Replacement MSI for a reasonable period after transfer.
- b. MSI shall re-draft the Exit Management Plan annually thereafter to ensure that it is kept relevant and up to date.
- c. Each Exit Management Plan shall be presented by MSI to and approved by the ISCDL or its nominated agencies.
- d. The terms of payment as stated in the Terms of Payment Schedule include the costs of MSI complying with its obligations under this Schedule.
- e. In the event of termination or expiry of MSA, and Project Implementation, each Party shall comply with the Exit Management Plan.
- f. During the exit management period, MSI shall use its best efforts to deliver the services.
- g. Payments during the Exit Management period shall be made in accordance with the Terms of Payment Schedule.
- h. This Exit Management plan shall be furnished in writing to the ISCDL or its nominated agencies within 90 days from the Effective Date of this Agreement.

6.10 Compliance to Standards & Certifications

- a. For a large and complex set up such as the Project, it is imperative that the highest standards applicable are adhered to. In this context, MSI will ensure that the entire Project is developed in compliance with the applicable standards.
- b. During project duration, MSI will ensure adherence to prescribed standards

as provided below:

#	Component/Application/System	Prescribed Standard
1.	Information Security	ISO 27001
2.	IT Infrastructure Management	ITIL specifications
3.	Service Management	ISO 20000 specifications
4.	Project Documentation	IEEE/ISO/CMMi (where applicable) specifications for

- c. Apart from the above MSI need to ensure compliance of the project with Government of India IT security guidelines including provisions of:
- The Information Technology Act, 2000” and amendments thereof and
 - Guidelines and advisories for information security published by Cert-In/MeitY (Government of India) issued till the date of publishing of tender notice. Periodic changes in these guidelines during project duration need to be complied with.
- d. While writing the source code for application modules MSI should ensure high-quality documentation standards to improve the readability of the software module. An illustrative list of comments that each module contained within the source file should be preceded by is outlined below:
- The name of the module
 - The date when module was created
 - A description of what the module does
 - A list of the calling arguments, their types, and brief explanations of what they do
 - A list of required files and/or database tables needed by the module
 - Error codes/Exceptions
 - Operating System (OS) specific assumptions
 - A list of locally defined variables, their types, and how they are used
 - Modification history indicating who made modifications, when the modifications were made, and what was done.
- e. Apart from the above MSI needs to follow appropriate coding standards and guidelines inclusive of but not limited to the following while writing the source code
- Proper and consistent indentation

- Inline comments
 - Structured programming
 - Meaningful variable names
 - Appropriate spacing
 - Declaration of variable names
 - Meaningful error messages
- f. Quality Audits
- ISCDL, at its discretion, may also engage independent auditors to audit any/some/all standards/processes. MSI shall support all such audits as per calendar agreed in advance. The result of the audit shall be shared with MSI who has to provide an effective action plan for mitigations of observations/non-compliances, if any.

6.11 Project Management and Governance

6.11.1 Project Management Office (PMO)

A Project Management office will be set up during the start of the project. The PMO will, at the minimum, include a designated full time Project Manager from MSI. It will also include key persons from other relevant stakeholders including members of ISCDL and other officials/representatives by invitation. The operational aspects of the PMO need to be handled by MSI including maintaining weekly statuses, minutes of the meetings, weekly/monthly/project plans, etc.

PMO will meet formally on a weekly basis covering, at a minimum, the following agenda items:

- i. Project Progress
- ii. Delays, if any – Reasons thereof and ways to make-up lost time
- iii. Issues and concerns
- iv. Performance and SLA compliance reports;
- v. Unresolved and escalated issues;
- vi. Project risks and their proposed mitigation plan
- vii. Discussion on submitted deliverable
- viii. Timelines and anticipated delay in deliverable if any
- ix. Any other issues that either party wishes to add to the agenda.

During the development and implementation phase, there may be a need for more frequent meetings and the agenda would also include:

- i. Module development status
- ii. Testing results
- iii. IT infrastructure procurement and deployment status
- iv. Status of setting up/procuring of the Helpdesk, DC hosting

- v. Any other issues that either party wishes to add to the agenda.

Bidder shall recommend PMO structure for the project implementation phase and operations and maintenance phase.

6.11.2 Helpdesk and Facilities Management Services

MSI shall be required to establish the helpdesk and provide facilities management services to support the ISCDL and stakeholder department officials in performing their day- to-day functions related to this system.

MSI shall setup a helpdesk dedicated (i.e. on premise) for the Project. This helpdesk would be operational upon implementation of the Project. Providing helpdesk/support services from a shared facility of any other party/provider is not permitted.

Functional requirements of the helpdesk management system, fully integrated with the enterprise monitoring and network management system. The system will be accessed by the stakeholder department officials for raising their incidents and logging calls for support. The detailed service levels and response time, which MSI is required to maintain for provisioning of the FMS services are described in the Service Level Agreement of this Tender.

MSI shall deploy Manpower during implementation and O&M phases. The deployed resource shall report to ISCDL’s Project In-charge for Smart City Project and work closely with Program Management Office of the project. Following are the minimum resources required to be deployed in the Project, however MSI may deploy additional resources based on the need of the Project and to meet the defined SLAs in this RFP:

#	Resources
1.	Operators
2.	Program Manager
3.	Solution Architect
4.	System Admin
5.	Network Expert

Note: Numbers provided for staff providing 24*7 support is excluding relievers.

6.11.3 Steering Committee

- The Steering Committee will consist of senior stakeholders from ISCDL, its nominated agencies and MSI. MSI will nominate its vertical head to be a part of the Project Steering Committee
- MSI shall participate in monthly Steering Committee meetings and update Steering Committee on Project progress, Risk parameters (if any), Resource deployment and plan, immediate tasks, and any obstacles in project. The Steering committee meeting will be a forum for seeking and getting approval for project decisions on major changes etc.
- All relevant records of proceedings of Steering Committee should be maintained, updated, tracked and shared with the Steering Committee and Project Management Office by MSI.
- During the development and implementation phase of the project, it is expected

that there will be at least fortnightly Steering Committee meetings. During the O&M phase, the meetings will be held at least once a quarter.

- Other than the planned meetings, in exceptional cases, ISCDL may call for a Steering Committee meeting with prior notice to MSI.

6.11.4 Project Monitoring and Reporting

- MSI shall circulate written progress reports at agreed intervals to ISCDL and other stakeholders. Project status report shall include Progress against the Project Management Plan, status of all risks and issues, exceptions and issues along with recommended resolution etc.
- Other than the planned meetings, in exceptional cases, project status meeting may be called with prior notice to the MSI. ISCDL reserves the right to ask the bidder for the project review reports other than the standard weekly review reports.

6.11.5 Risk and Issue management

- MSI shall develop a Risk Management Plan and shall identify, analyse and evaluate the project risks, and shall develop cost effective strategies and action plans to mitigate those risks.
- MSI shall carry out a Risk Assessment and document the Risk profile of ISCDL based on the risk appetite and shall prepare and share the ISCDL Enterprise Risk Register. MSI shall develop an issues management procedure to identify, track, and resolve all issues confronting the project. The risk management plan and issue management procedure shall be done in consultation with ISCDL.
- MSI shall monitor, report, and update the project risk profile. The risks should be discussed with ISCDL and a mitigation plan be identified during the project review/status meetings. The Risk and Issue management should form an agenda for the Project Steering Committee meetings as and when required.

6.11.6 Governance procedures

MSI shall document the agreed structures in a procedures manual.

6.11.7 Planning and Scheduling

MSI will prepare a detailed schedule and plan for the entire project covering all tasks and sub tasks required for successful execution of the project. MSI has to get the plan approved from ISCDL at the start of the project and it should be updated every week to ensure tracking of the progress of the project.

The project plan should include the following:

1. The project break up into logical phases and sub-phases;
2. Activities making up the sub-phases and phases;
3. Components in each phase with milestones;
4. The milestone dates are decided by ISCDL in this RFP. MSI cannot change any of the milestone completion dates. MSI can only propose the internal task deadlines while keeping the overall end dates the same. MSI may suggest improvement in project dates without changing the end dates of each activity.

5. Key milestones and deliverables along with their dates including those related to delivery and installation of hardware and software;
6. Start date and end date for each activity;
7. The dependencies among activities;
8. Resources to be assigned to each activity;
9. Dependency on ISCDL

6.11.8 License Metering / Management

MSI shall track software usage throughout the IT setup so as to effectively manage the risk of unauthorized usage or under-licensing of software installed at the ITMS, and DC. This may be carried out through the use of standard license metering tools.

6.12 Change Management & Control

6.12.1 Change Orders / Alterations / Variations

- a. MSI agrees that the requirements given in the Bidding Documents are minimum requirements and are only indicative. The vendor would need to etch out the details at the time of preparing the design document prior to actual implementation. It shall be the responsibility of MSI to meet all the requirements of technical specifications contained in the RFP and any upward revisions and/or additions of quantities, specifications sizes given in the Bidding Documents required to be made during execution of the works, shall not constitute a change order and shall be carried out without a change order and shall be carried out without any time and cost effect to Purchaser.
- b. Further upward revisions and or additions required to make MSI's selected equipment and installation procedures to meet Bidding Documents requirements expressed and to make entire facilities safe, operable and as per specified codes and standards shall not constitute a change order and shall be carried out without any time and cost effect to Purchaser.
- c. Any upward revision and/or additions consequent to errors, omissions, ambiguities, discrepancies in the Bidding Documents which MSI had not brought out to the Purchaser's notice in his bid shall not constitute a change order and such upward revisions and/or addition shall be carried out by MSI without any time and cost effect to Purchaser.

6.12.2 Change Order

- a. The Change Order will be initiated only in case (i) the Purchaser directs in writing MSI to include any addition to the scope of work covered under this Contract or delete any part of the scope of the work under the Contract, (ii) MSI requests to delete any part of the work which will not adversely affect the operational capabilities of the facilities and if the deletions proposed are agreed to by the Purchaser and for which cost and time benefits shall be passed on to the Purchaser, (iii) the Purchaser directs in writing MSI to incorporate changes or additions to the technical specifications already covered in the Contract.
- b. Any changes required by the Purchaser over and above the minimum

requirements given in the specifications and drawings etc. included in the Bidding Documents before giving its approval to detailed design or Engineering requirements for complying with technical specifications and changes required to ensure systems compatibility and reliability for safe operation (As per codes, standards and recommended practices referred in the Bidding Documents) and trouble free operation shall not be construed to be change in the Scope of work under the Contract.

- c. Any change order comprising an alteration which involves change in the cost of the works (which sort of alteration is hereinafter called a “Variation”) shall be the Subject of an amendment to the Contract by way of an increase or decrease in the schedule of Contract Prices and adjustment of the implementation schedule if any.
- d. If parties agree that the Contract does not contain applicable rates or that the said rates are inappropriate or the said rates are not precisely applicable to the variation in question, then the parties shall negotiate a revision of the Contract Price which shall represent the change in cost of the works caused by the Variations. Any change order shall be duly approved by the Purchaser in writing.
- e. Within ten (10) working days of receiving the comments from the Purchaser or the drawings, specification, purchase requisitions and other documents submitted by MSI for approval, MSI shall respond in writing, which item(s) of the Comments is/are potential changes(s) in the Scope of work of the RFP document covered in the Contract and shall advise a date by which change order (if applicable) will be submitted to the Purchaser.

6.13 Testing and Acceptance Criteria

- a. MSI shall demonstrate the following mentioned acceptance criteria prior to acceptance of the solution as well as during project operations phase, in respect of scalability and performance etc. MSI may propose further detailed Acceptance criteria which the ISCDL will review. Once ISCDL provides its approval, the Acceptance criteria can be finalized. In case required, parameters might be revised by ISCDL in mutual agreement with bidder and the revised parameters shall be considered for acceptance criteria. A comprehensive system should be set up that would have the capability to log & track the testing results, upload & maintain the test cases and log & track issues/bugs identified.
- b. The following table depicts the details for the various kinds of testing envisaged for the project:

Type of Testing	Responsibility	Scope of Work
System Testing	✓ MSI	<ul style="list-style-type: none"> ▪ MSI to perform System testing ▪ MSI to prepare test plan and test cases and maintain it. ISCDL may request MSI to share the test cases and results ▪ Should be performed through manual as well as automated methods ▪ Automation testing tools to be provided by MSI. ISCDL doesn't intend to own these tools
Integration	✓ MSI	<ul style="list-style-type: none"> ▪ MSI to perform Integration testing

Type of Testing	Responsibility	Scope of Work
Testing		<ul style="list-style-type: none"> ▪ MSI to prepare and share with ISCDL the Integration test plans and test cases ▪ MSI to perform Integration testing as per the approved plan ▪ Integration testing to be performed through manual as well as automated methods ▪ Automation testing tools to be provided by MSI
Performance and Load Testing	<ul style="list-style-type: none"> ✓ MSI ✓ ISCDL / Third Party Auditor (to monitor the performance testing) 	<ul style="list-style-type: none"> ▪ MSI to do performance and load testing. ▪ Various performance parameters such as transaction response time, throughput should be taken into account. ▪ Load and stress testing of the Project to be performed. ▪ Test cases and test results to be shared with ISCDL ▪ Performance testing to be carried out in the exact same architecture that would be set up for production. ▪ MSI need to use performance and load testing tool for testing. ISCDL doesn't intend to own these tools. ▪ ISCDL if required, could involve third party auditors to monitor/validate the performance testing. Cost for such audits to be paid by ISCDL
Security Testing (including Penetration and Vulnerability testing)	<ul style="list-style-type: none"> ✓ MSI ✓ ISCDL / Third Party Auditor (to monitor the security testing) 	<ul style="list-style-type: none"> ▪ Solution should demonstrate the compliance with security requirements as mentioned in the RFP including but not limited to security controls in the application, at the network layer, network, data center (s), security monitoring system deployed by MSI ▪ Solution shall pass vulnerability and penetration testing for rollout of each phase. The solution should pass web application security testing for the portal, mobile app and other systems and security configuration review of the infrastructure. ▪ MSI should carry out security and vulnerability testing on the developed solution. ▪ Security testing to be carried out in the exact same environment/architecture that would be set up for production. ▪ Security test report and test cases should be shared with ISCDL ▪ Testing tools if required, to be provided by MSI. ▪ During O&M phase, penetration testing to be conducted on yearly basis and vulnerability

Type of Testing	Responsibility	Scope of Work
		assessment to be conducted on half-yearly basis. <ul style="list-style-type: none"> ▪ ISCDL will also involve third party auditors to perform the audit/review/monitor the security testing carried out by MSI. Cost for such auditors to be paid by ISCDL
User Acceptance Testing of Project	✓ ISCDL or ISCDL appointed third party auditor	<ul style="list-style-type: none"> ▪ ISCDL / ISCDL appointed third party auditor to perform User Acceptance Testing ▪ MSI to prepare User Acceptance Testing test cases ▪ UAT to be carried out in the exact same environment/architecture that would be set up for production ▪ MSI should fix bugs and issues raised during UAT and get approval on the fixes from ISCDL /third party auditor before production deployment ▪ Changes in the application as an outcome of UAT shall not be considered as Change Request. MSI has to rectify the observations.

Note:

- a. Bidder needs to provide the details of the testing strategy and approach including details of intended tools/environment to be used by MSI for testing in its technical proposal. ISCDL does not intend to own the tools.
- b. MSI shall work in a manner to satisfy all the testing requirements and adhere to the testing strategy outlined. MSI must ensure deployment of necessary resources and tools during the testing phases. MSI shall perform the testing of the solution based on the approved test plan, document the results and shall fix the bugs found during the testing. It is the responsibility of MSI to ensure that the end product delivered by MSI meets all the requirements specified in the RFP. MSI shall take remedial action based on outcome of the tests.
- c. MSI shall arrange for environments and tools for testing and for training as envisaged. Post Go-Live; the production environment should not be used for testing and training purpose. If any production data is used for testing, it should be masked and it should be protected. Detailed process in this regard including security requirement should be provided by MSI in its technical proposal. The process will be finalized with the selected bidder.
- d. All the Third Party Auditors (TPA) as mentioned above will be appointed and paid by ISCDL directly. All tools/environment required for testing shall be provided by MSI.
- e. STQC/Other agencies appointed by ISCDL shall perform the role of TPA. MSI needs to engage with the TPA at the requirement formulation stage itself. This is important so that unnecessary re-work is avoided and the audit is completed in time. The audit needs to be completed before Go-Live of different phases. MSI

needs to prepare and provide all requisite information/documents to third party auditor and ensure that there is no delay in overall schedule.

- f. The cost of rectification of non-compliances shall be borne by MSI.

6.14 Factory Testing

MSI shall have to submit Factory Test Certificate for the below mentioned materials before the actual supply of the items.

1. Cable
2. Pole
3. Camera
4. ATCS

Authorized representative from ISCDL may visit the manufacturing plant of the product subject to present in India. Authorized representative will check the testing process.

6.15 Final Acceptance Testing

The final acceptance shall cover 100% of the Project, after successful testing by the ISCDL; a Final Acceptance Test Certificate (FAT) shall be issued by the ISCDL to MSI.

Prerequisite for Carrying out FAT activity:

1. Detailed test plan shall be developed by MSI and approved by ISCDL. This shall be submitted by MSI before FAT activity to be carried out.
2. All documentation related to the Project and relevant acceptance test document (including IT Components, Non IT Components etc.) should be completed & submitted before the final acceptance test to the ISCDL.
3. The training requirements as mentioned should be completed before the final acceptance test.
4. Successful hosting of Application, NMS and MIS Software.
5. For both IT & Non-IT equipment's / software manuals / brochures / Data Sheets / CD / DVD / media for all the Indore Project supplied components.

The FAT shall include the following:

1. All hardware and software items must be installed at respective sites as per the specification.
2. Availability of all the defined services shall be verified.
3. MSI shall be required to demonstrate all the features / facilities / functionalities as mentioned in the RFP.
4. MSI shall arrange the test equipment required for performance verification, and will also provide documented test results.
5. MSI shall be responsible for the security audit of the established system to be carried out by a certified third party as agreed by ISCDL.

Any delay by MSI in the Final Acceptance Testing shall render him liable to the

imposition of appropriate Penalties. However, delays identified beyond the control of MSI shall be considered appropriately and as per mutual agreement between ISCDL and MSI. In the event MSI is not able to complete the installation due to non-availability of bandwidth from the bandwidth service providers, the Supplier and ISCDL may mutually agree to redefine the Network so MSI can complete installation and conduct the Final Acceptance Test within the specified time.

7 Specifications

7.1. IT Components

7.1.1. Monitoring Workstations

Parameter	Minimum Specifications
Operating System (OS)	Pre-loaded latest build of licensed Windows 10 Pro 64 bit with latest updates and security patches. The Operating System along with all Utilities and driver software should also be provided bundled in CD/DVD/Pen-drive media.
CPU	Intel Xeon E5-1620v2 3.7 10M 1866 4C CPU or Higher
Memory/ Storage	32 GB DDR3 RAM / 1TB 7200RPM SATA
Mouse/ Keyboard	Bluetooth Optical Mouse and Bluetooth Keyboard
Graphics Card	NVIDIA Quadro K1200
Monitor	TFT LED22" or Higher
Network connection	Gigabit Ethernet (GigE) network connection required
Certification	Certification Energy star 5.0/BEE star certified
Pre-loaded software	Latest version of MS Office (with minimum MS Word, MS Excel, MS Power Point), Latest version of Adobe Acrobat Reader, Scanning Software (as per scanner offered). These software shall be preloaded (at the facility of OEM or any other location) before shipment to ISCDL offices/locations.

7.1.2. Industrial grade Switch

Layer 2 Industrial Switch 8 port copper Plus 4 port Fiber 1 G ports	
Sno	Specifications
1	The Switch Should be Industrial grade in nature and should have eight 10/100/1000 Base-T PoE+ ports out of which three ports can support 60W HPoE.
2	Switch Should have additional four 100/1000 Base-X SFP ports and to be supplied with one number of 1000Base-LX industrial Gigabit Ethernet optical transceiver.
3	The switch should have maximum switching capacity of 24Gbps.
4	Switch Should support 48K mac addresses and 4000 VLAN
5	Switch should support auto fabric technology for ease of deployment
6	Switch should support MACSec and IEEE 1588v2 PTP
7	Switch should support surge protection of 6KV on copper ports
8	Switch should support maximum POE Budget of 200 watt
9	Operating Temperature of switch should be -40°C to 75°C
10	The switch should have internal/external (DIN rail mountable) AC power supply.
11	Protection Class should be minimum IP 30 and NEMA TS-2
12	Switch should support ERPv2, Jumbo frame , Bridge Protocol Data Unit (BPDU) blocking , STP Root Guard , DHCP Option 82 , IEEE 802.1ad .
13	Switch should support DHCP Snooping, DHCP IP and Address Resolution Protocol (ARP) spoof protection, ARP poisoning detection, IP Source Filtering.
14	Switch should support IGMP v1/v2/v3 snooping , MLD v1/v2 and should have should have Digital Diagnostic monitoring
15	Switch should be EN 55022 (Emission Standard) , EN 55024 (Immunity Standard)
16	Warranty 3 years hardware replacement Including 24x7 Remote Tel Support, Diagnosis, SW Upgrades.

7.1.3. Field UPS

S. No.	Features	Description
1.	General	<p>The system shall be IP 55 with wall/floor and Pole mount option.</p> <p>This shall withstand the high temperature operation requirement as the system is exposed to outdoor environment.</p> <p>The system shall be unique and equipment space should be efficiently designed and the thermal condition should be evenly managed.</p> <p>Material of Cabinet is GI -120 GSM, Surface treatment PP Coating 80-120 Micron and Color-RAL (7035).</p> <p>Size: OEM to Comment</p>
2.	General	<p>It shall be SMPS based and shall communicate with controller to charge the battery and provide the output.</p> <p>Rectifiers shall be modular and work in parallel to share the load and provide redundancy.</p> <p>Failure of one module shall not affect operation of another module and other module shall keep working to feed the load.</p> <p>Rectifier shall have all the power connection on the backplane and shall be hot plug type in prewired shelf.</p>
Rectifier Specification		
3	Nominal Input Voltage	90 to 300 VAC
4	Full Power operating range	180 to 300 VAC
5	Operating Frequency	45 to 65 Hz
6	Rectifier Module Capacity	1000 Wattage of each module (N+1) with 1 Redundant rectifier module
7	Maximum. input current per Rectifier.	<6 Amps each module
8	Efficiency at nominal condition	>90%
9	Power Factor	>0.99

10	Operating Temperature	-40 to 75 Deg C
11	Relative Humidity	0 to 95% (Non-condensing)
12	Parallel Operation	Yes
13	Modular / Hot swappable	Yes
14	Module communication with controller	CANBUS
Controller		
15	General	The controller shall be advanced controller to take care of Lithium Ion Battery charging. The controller shall have microcontroller based functionality. The controller shall able to provide data over SNMP and shall be able to integrate with GSM modem for remote communication
16	Controller Interface	Digital, CANBUS
17	Rectifier interface	CAN-based
18	Rectifier Operation	Parallelable
19	Digital Input	8
20	Relay Output	8
21	Temperature Monitoring	Ambient and Battery
22	Voltage, Current	Load, Battery
23	Display	LCD Display
24	Local Monitoring	LAN / WEB browser
25	Remote Monitoring	LAN / Modem, GSM, GPRS / WEB browser/SNMP V2C/Modbus
26	Remote alarming	Dry contacts / SNMP
27	Data Logs	up to 5,000 entries with Min., Max, Average value shall be recorded for selected parameter.
28	Languages	English
29	Local user interface	Configurable LEDs; LCD display; Keypad
30	WEB	Different access levels; More than 200 dynamic WEB pages; SW and setup updates locally and remotely

31	SNMP	Remote alarms using traps
32	Parameter Setting	Keypad on Controller
33	Safety	EN 60950, class I; UL 60950; CAN / CSA - C22.2
34	EMC	EN 55022/EN 61000-6/1 class B; ETSI EN 300386 compliant
35	Cooling	Natural air flow
36	Operating temperature	0 to +65 °C / +32 to +140 °F
37	Relative humidity	95 %, non-condensing
38	Battery management	Temperature compensated Float charge, Boost and equalize charge for VRLA/SMF
39		Charging Current Limitation (advanced)
40		Low voltage disconnection, State of charge supervision and display
41		Backup time supervision / Life time prediction, Automatic capacity test
42		Symmetry supervision for voltage and currents
43		Block voltage supervision
44	Rectifier management	Microcontroller based for customization and supervision and control of auxiliary devices
45		AC measurement (internal / external)
46		Mains failure detection and alarming
47		Rectifier Redundancy Supervision
48		LLVD and BLVD functions
49		Configurable event log and data log up-to 5k Logs
50	System Management	Individual rectifier information and control
Lithium Ion Battery Specification		
51	Battery-Lithium-Ion	The system should be designed to work with Lithium Ion battery (20AH)
52	Technology	LiFePO4
53	Nominal Voltage	48V

54	Cycles	>3000 Cycles @ 80% DOD
55	Operating Temperature Range (Charge)	Charging: 0°C to +55°C Discharging: -20°C to +60°C
56	Discharge Ending Voltage	42V
57	Charging Limited Voltage	54.0 V
58	Weight	Kg. (OEM to specify)
59	Dimensions (L*W*H) mm (inches)	440 * 340 * 89 (2U) all in mm 19Inch Mounting Provision 2U Height

Inverter Specification

S. No.	Features	Description
60	Input DC Voltage Range	40 – 57.6 VDC
61	Nominal Input Voltage	48 VDC
62	Low Voltage Cut off	42V DC
63	Reverse Polarity Protection	Yes
64	Nominal system voltage	230 V + 5%
65	Continuous Power	700W
66	Output	Sine wave
67	Overload Capacity	110% for 60 sec 150% for 3 sec..
68	THD	<3% (resistive load)
69	Output frequency	50 + 5%
70	Short Circuit Protection	Yes
71	Over Temperature Protection	Yes

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72	Efficiency (75-100% of full loading)	88% peak
73	Operating temperature	-5 to +70 °C Full Power – up to 55°C (reduced Power @ 65 °C)
74	Communication Interface	RS 485 / Modbus / SNMP

Annexure A: Tentative Number of Location of Traffic Junctions

S.no	Junction Name	Number of Approach
1.	Laxmibai Stachue Square	3
2.	Tata Steel Square	5
3.	Ramchandra Nagar Square	4
4.	Musakhedi Square	4
5.	Sindhi Colony Square	4
6.	Bombay Hospital Square	4
7.	Palhar Nagar Square	4
8.	Patrakar Square	4
9.	Saket Square	4
10.	Bada Ganpati Square	4
11.	IT Park Square	4
12.	Radisson Square	4
13.	MR-9 Square (Robot)	4
14.	Khazrana Square	4
15.	Bengali Square	4
16.	Agriculture College Square	4
17.	Shreemaya Square	4
18.	Chhavni Square	4
19.	Tower Square	4
20.	Palsikar Square	4
21.	Mhownaka Square	5
22.	Bata Square	4
23.	Nandlalpura Square	4
24.	Mrugnayani Square	3
25.	Jail Road Square	2
26.	Kothari Market Square	3
27.	Lal Hospital Square	2
28.	Exise Square	3
29.	Rambaugh Square	4
30.	Marimata Square	4
31.	Mahesh Gard Line Square	3
32.	Gandhi Nagar Square (SC)	3
33.	Regal Square	3
34.	High Court Square	3
35.	Ghantaghar Square	4
36.	Lentern Square	4
37.	Patnipura Square	4
38.	SCHEME NO. 78	3

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39.	SHALIMAR	2
40.	SATYSAI SQUARE	4
41.	VIJAYNAGAR SQUARE	4
42.	RASOMA SQUARE	5
43.	MR9	4
44.	PRESS COMPLEX MID BLOCK	2
45.	LIG SQUARE	4
46.	INDUSTRY HOUSE MID BLOCK	2
47.	INDUSTRY HOUSE	3
48.	PALASIYA SQUARE	4
49.	GEETABHAWAN SQUARE	4
50.	AICTSL MID BLOCK	2
51.	SHIVAJI VATIKA SQUARE	5
52.	GPO SQUARE	4
53.	INDRAPRATIMA SQUARE	3
54.	NAVLAKHA SQUARE	5
55.	BHAWARKUWA SQUARE	4
56.	VISHNU PURI MID BLOCK	2
57.	MATA GUJRI SQUARE	2
58.	RAJIVGANDHI MID BLOCK	2
59.	Dargah T Square	4
60.	Home Gard T Square	4
61.	Pipliyahana Square	4
62.	Niranjanpur Square	4
63.	Chankyapuri Square	4
64.	Futtykothi Square	4
65.	Bhourasala Square	4