SURAT MUNICIPAL CORPORATION

REQUEST FOR PROPOSAL

for

SELECTION OF IMPLEMENTATION AGENCY FOR INTEGRATED TRAFFIC CONTROL SYSTEM (ITCS) IN SURAT CITY

Volume 2 – Scope of Work

Tender Number: GM(IT)/SSCDL/BRTS/ITCS/1/2017-2018

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Re-Invited by
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Smart City

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2.   Glossary

Terms	Meaning
ITCS	Integrated Traffic Control System
BOM	Bill of Material
BEC	Bidders Evaluation Committee
CCTV	Closed Circuit Television
CEO	Chief Executive Officer
GIS	Geographical Information Systems
GoG	Government of Gujarat
GPS	Global Positioning System
HOD	Head of Department
ICT	Information and Communication Technology
LoI	Letter of Intent
OEM	Original Equipment Manufacture
RFP	Request for Proposal
SMC	Surat Municipal Corporation
SSCDL	SURAT Smart City Development Limited
SI	System Integrator
SLA	Service Level Agreement
TCC	Traffic Command Control Center

3.   Definitions

Term	Definition
All red	A condition when only red aspects are displayed. The All Red is executed when an abrupt signal change is required (e.g. power up, flash-to-signal, manual-to-auto, hurry call-to-auto, etc.).
Amber time	Duration of the amber display for a phase or a movement
ATCS	Adaptive Traffic Control Systems are traffic responsive systems that use data from vehicle detectors and optimize traffic signal settings in an area to reduce vehicle delays and stops.
Cable-less linking facility	A method of linking traffic signals along a corridor and / or in an area using timing information derived from their master time clock systems.
Central computer	A computer system that is connected to all traffic signal controllers under the ATCS through the communication network. The network control software runs at the Central Computer
Clearance amber	Clearance Amber is the warning signal to traffic streams approaching the Stop Line, commenced at the change of a right of way.
Communication network	A wired or wireless facility used to send and receive data between the Central Computer and the Traffic Signal Controller
CAMC	Comprehensive Annual Maintenance Contract
Conflict plan	Any competing phases that are not allowed simultaneously are defined as conflicting phases. The Conflict plan is a listing of all conflicting groups.
Corridor	An arterial road with several intersections
Cycle plan	Each signal switching schemes make a Cycle Plan. Change of a stage switching sequence or stage timings define a new cycle plan.

Term	Definition
Cycle	Cycle is the total time period required for one complete sequence of signal switching scheme, in which all stages are given some fixed order.
Day plan	Day Plan is the distribution of cycle plans for a particular day.
Decision support	Reports, Graphs, Traffic Simulator interface
Filter green	The Filter Green provides signal for the turning traffic. When linked with a vehicle phase the termination of filter green is blackout; otherwise it flash for few seconds (equivalent to clearance amber time) before termination.
Fixed time operation	None of the stages are preempted
Full ATCS	The signal controllers shall accept stage timings from the ATCS application and report back the operational parameters to the central server
Full VA cycle	Vehicle Actuated operation of signal controller with fixed cycle length
Full VA	Preemption enabled for all the stages
GPS (global positioning system)	A satellite-based radio navigation system developed and operated by the U.S. Department of Defense (DOD). GPS permits users to determine time, date and day of week 24 hours a day, in all weather, anywhere in the world with a precision and accuracy.
Green running period	Split time utilized for the Stage
Green wave	A scheme that give right-of-way progressively at all intersections in a corridor
Hurry call	The Hurry Call mode will provide the means to force the controller to a defined stage, without violating safety clearances.

Term	Definition
Indicative green	The Indicative Green is a continuously flashing signal/steady signal, which provides signal for the free left turning traffic. The termination of indicative green is always blackout.
Inter green	This is the time period between the end of the green signal for one stage and the beginning of the green signal for the following stage.
Loop	The sensor element of a vehicle detector
Maximum green period	Maximum Green period is the maximum time period for which a green light can be in the ON state in a particular stage.
Minimum green period	This facility ensures that a phase loses right of way only after a minimum time period has elapsed. This minimum time is defined as Minimum Green Period. It will not be possible to terminate prematurely the minimum green period.
Network control software	ATCS application software that generate, monitor and manage the signal plan timings for all intersections under the ATCS.
Offset	Offset is defined as the difference between the start/termination of green time at the successive upstream and downstream signals.
Pedestrian movements	The Pedestrian phase contains two signal aspects, viz. Red and Green. The termination of pedestrian phase can be either red flash or green flash.
Performance index	A measure of effectiveness on the applied control strategy
Phase	The sequence of conditions applied to one or more streams of vehicular or pedestrian traffic, which always receive identical signal light indications. The controller provides facilities for a number of phases, each phase provide control for one of the following:

Term	Definition
Power saving	Signal lamp intensity control based on ambient light during different time of the day.
Priority route	A route in a corridor that carry maximum volume of traffic at a given point of time.
Priority stage	A stage that is a part of the priority route
Red extension	When a right of way is terminated with Clearance amber, opening of the next right of way is delayed by the Red Extension period. With no continuing phase this gives an effect of all red between stage changes.
Right-of-way	A visual signal to go-ahead
Semi-actuation	One or more stages are not preempted in vehicle actuated signal operation
System Integrator (SI)	The successful bidder will be referred as SI
Special day plan	Holidays falling on normal weekdays can be treated as special days and can have a different day plan.
Split	A Split decides how long a Stage should remain; i.e. the duration of a given right of way.
Stage preemption	A facility to terminate a Stage execution before it reaches the Green running time set for that Stage. The Stage preemption happens when there is no continuous vehicle demand on the corresponding approach.
Stage skipping	Facility for a stage to appear only when demanded
Stage	A stage can primarily be considered as a condition of signal lights during a period of the cycle, which gives right of way to one or more traffic

Term	Definition
	movements. One or more phases form a Stage (Group). Stage is a group of non- conflicting phases
Traffic lane	A lane is part of a roadway (carriageway) that is designated for use by a single line of vehicles, to control and guide drivers and reduce traffic conflicts.
Traffic Command Centre (TCC)	Place where the Central Computer resides and all communication network links are aggregated.
Traffic signal controller	A microcontroller based equipment with solid state traffic signal lamp switching module.
Vehicle detector	A device that detect the presence and passage of a vehicle.
Vehicular movements	The Vehicle phase contains three signal aspects, viz. Red, Amber and Green. The termination of vehicle phase is always with clearance amber.
Week plan	Week Plan is the distribution of available day plans for a week.
Zone	A small area with limited no. of intersections in a city under ATCS.

4. Introduction

4.1. Project Background

Surat Municipal Corporation (SMC) under the ambit of smart city initiatives intends to utilize information technology to modernize Traffic management, Traffic control, Traffic Law enforcement and traffic information dissemination in the city to enable Surat Traffic Police & Surat Municipal Corporation in ensuring smooth traffic flow and informed road users.

Surat, a city which has urbanized rapidly in recent years, has witnessed enormous growth in traffic volumes which have, resulted in several traffic problems in and around the city, such as traffic jams, increase in number of road accidents etc. A need was felt to develop an Integrated Traffic Control System (ITCS), which would aim at improving the efficiency and effectiveness of the traffic system on Surat roads. Implementation of ITCS is an initiative taken by SSCDL to provide a secure and pleasant road experience to citizens of Surat.

To realize the benefits of ITCS, it is pertinent to adopt an approach that includes technology based regulation, intervention, information and enforcement system to improve the mobility, discipline and safety on Surat roads. Therefore, ITCS is envisaged with multiple applications, including Adaptive Traffic Control Systems, Red Light Violation Detection (RLVD) systems, Speed Detection Systems, Variable message sign boards, Traffic Surveillance Cameras, ANPR Cameras, Emergency Call Box (ECB) systems amongst others which will ensure that the intended outcomes have been accomplished.

ITCS integrates various sub systems (such as CCTV, Vehicle detection, communication, variable message signs etc.) in a coherent single interface that provides real time data on status of traffic and predicts traffic conditions for more efficient planning and operations. Thus, a system such as ITCS shall aim to help police and SMC to take proactive/ reactive measures and ensure safe & smooth environment on road.

Thus SSCDL intends to establish an ITCS through a process of competitive bidding and selecting a SI for Supply, Installation, Commissioning, Testing and maintenance for 5 years (i.e 1 year warranty & 4 years of comprehensive AMC) of the following:

1. **Adaptive Traffic Control System (ATCS)** – Vehicle detectors, Signal controller, Traffic light aspects, poles, power supply provisioning and related accessories and associated civil work including cabling for successful operation of the system.

2. **Traffic Enforcement systems** such as ANPR, Red Light Violation Detection (RLVD) System, Traffic Violation cameras, Speed Detection System along with related accessories and required mounting infrastructure including civil work for successful operation of the system.

3. **Traffic Surveillance Cameras** and **Smart City Components** like Variable Massage Signage Board and ECB along with related accessories and required mounting infrastructure including civil work for successful operation of the system.

4. **MPLS network** services to transfer the data from field devices to the **Traffic Command Center** (TCC) for a period of one year, following which SMC's captive hardware will be used.

5. Set up Traffic Command Center and **Data Center (DC)** with required software platform capability to aggregate incoming data streams onto a single platform, provide traffic flow estimates for near term future (Near term forecast over 5, 10, 15... 30mins... 1 hour interval) on a real-time basis and assist in analyzing impact of alternate traffic management strategies.

6. **IT infrastructure** including hardware and software at TCC and DC for the management of the edge devices signal, command center and the traffic management software platform.

7. Develop individual signal control strategies including definition of signal grouping, setting of potential strategies for traffic control under various scenarios, specification of traffic management strategies for planned and unplanned events.

8. Develop a consolidated database of incoming real time data for future analysis and evaluation purposes. It is envisaged that the proposed adaptive traffic control system will incorporate historic trends for development of traffic management strategies and adaptive control strategies.

9. Capacity building for various government agencies and administrative arms of SSCDL /SMC through development of Training manuals, continuous maintenance of hardware and software for 5 years period, training of administrative and management personnel including handholding the TCC operations for 5 year.

10. Comprehensive Operation & maintenance of all above components for a period of 5 years.

4.2. Project Objectives

The broad objectives of the project are as follows:

1. **Improve Journey Time Reliability:** Improve reliability in journey times between various locations, so that citizens can experience an enhanced quality of road based transportation, through improving sustainability and efficiency in operation of the road network.

2. **Increased Traffic Signal Efficiency:** Reduction in traffic delays, optimized cycle times at intersection to regulate and maintain normal flow of traffic to enhance the efficiency of the transport infrastructure.

3. **Increase Operational Efficiency:** The system is intended to offer operational efficiency to traffic management agency by way of extending IT based compliance process on ground and enable the agency to deliver better traffic conditions and safe operating conditions.

4. **Improve Customer Services:** The traffic services to the public can be improved through the user-friendly presentation of the various traffic information in real time through sharing of all relevant data feeds for public consumption. These functions will lead to informed travel conditions within the technology influence area**.**

5. **Improve Safety:** The real-time traffic monitoring and intelligent traffic systems can prevent accidents by recognizing and thus responding to the potentially dangerous situation in advance**.**

6. **Increased Productivity:** Achieving improvement in the productivity, logistics and other economic activities by obtaining the precise-real time information on transport due to the availability of data on traffic flow in key areas of the city. The transport data can also be used to take policy decisions to ensure sustained productive environment**.**

7. **Real Time Information, Event Tracking & Response, and Fast Access to Information:** The real-time information at the TCC shall enable the operator to take necessary actions based on the type of information. Sending an emergency vehicle to the spot, arranging alternate route to VIP convoys, diverting the traffic to different routes are some of the actions that can be taken based on the Real Time Information. It shall be possible to track a particular event using the cameras installed at the traffic junction. A vehicle, violating the traffic could be tracked and penalized at the next traffic junction based on the vehicle registration number**.**

8. **Creating awareness for public:** Through electronic sign boards, mobile applications, awareness on road traffic rules and safe driving precautions shall be imparted to road users.

9. **Enforcement:** Effective enforcement of traffic violation, checking and monitoring shall reduce the traffic related offences of Red Light violations and over speeding violations**.**

4.3. Existing Systems and Infrastructure

There are around 72 exiting traffic signals implemented in Surat to help commuters navigate traffic with ease. Further, surveillance cameras have been established under the Surat Safe City project which are being used to identify the traffic violators and issue Challans. Surat police department has also implemented a centralized command center at Police Commissioner's office to which the various surveillance and other cameras are connected.

4.3.1. Traffic Signals

The following table provides the details of the existing Traffic signals in Surat.

#	Type of Traffic Signal System	Number of Junctions
1	Fixed Time Traffic Signals	27
2	Vehicle Actuated Time Traffic Signals	45
3	Vehicle Actuated Time Traffic Signals (Under Implementation)	49

It will be the responsibility of the System Integrator(SI) to upgrade and integrate the existing 27 fixed timer based traffic signaling system with the proposed ITCS under the scope of this project. Moreover, the existing vehicle actuated traffic signals implemented in BRTS corridor are also required to be integrated with ITCS. The detailed locations are provided in the **Annexure I** of this document.

4.3.2. Surat Safe City System

Surat Police Department had launched Surat Safe City project for safety & security of citizens in year 2013 consisting of over 600 CCTV cameras with Centralized Command & Control room for monitoring. The various project components implemented are Fixed Cameras, Pan Tilt Zoom (PTZ) Cameras, ANPR Cameras, Picture Intelligence Unit (PIU), Face Recognition System, and Speed Identification. The locations along with number of cameras are provided in the **Annexure I** of this document.

4.3.3. Web Portal & Miscellaneous System

The Surat Traffic Police currently maintains a website (www.suratcitypolice.org) which provides information about the various Traffic rules & regulations, road safety, emergency service, details on traffic police-public interface, Challan notice information, and road safety measures.

4.3.4. E-Challan System

Surat police department had launched e-challan system in year 2013 to identify motorists flouting traffic rules. The e-challan system includes manually delivery of e-challans by post at the house of those who are caught on CCTV cameras violating traffic rules. The various system components include E-Challan Server with software application, 20 client workstations are operating at Police Command Center.

It will be the responsibility of the SI to integrate incidents captured from various traffic enforcement/ surveillance cameras proposed under ITCS with the existing e-Challan system

deployed at Police Command Control Center. The SI will also provide the live feeds/snapshots of cameras deployed under this project to Police Department. Police department will also has the access to various systems / cameras proposed from their command control center.

The details of the existing e-challan system infrastructure are provided in the **Annexure I** of this document.

4.3.5.Smart City Center (SMAC)

One of the flagship project implemented under smart city initiatives is the Smart City Center (SMAC). The SMAC is an administrative command and control Centre- to monitor effective delivery of all civic services. SI to ensure that ITCS system / information (including Cameras feeds) are accessed through SMAC as well. This will facilitate the SMC to monitor their various civic services like road maintenance, encroachments, garbage etc. through surveillance cameras.

4.3.6. Exiting ATCS Data Center Infrastructure

As mentioned in above section, there are around 45 vehicle actuated traffic signals implemented by existing vendor in BRTS corridor and around 49 more signals are being implemented. To manage and monitor these signals a centralized command control center along with the Data center are also set up at Surat. SSCDL intends to utilize these exiting Data Center infrastructure for the proposed ITCS. SI may propose to upgrade / use these exiting infrastructure while designing their solution.

The list of various components implemented in Data Center is provided in Annexure III

5. Scope of Services for the Project

5.1. Overview

The SI should ensure the successful implementation of the proposed Integrated Traffic Control System (ITCS) and provide capacity building support to city authorities as per the scope of services described below. Any functionality not expressly stated in this document but required to meet the needs of the SSCDL to ensure successful operations of the system shall essentially be under the scope of the SI and for that no extra charges shall be admissible. SI shall implement and deliver the following systems and capabilities linked with traffic command center.

1. Adaptive Traffic Control System (ATCS)

2. Red Light Violation Detection (RLVD) System

3. Automatic Number Plate Recognition (ANPR) System

4. Traffic Violation Cameras

5. Traffic Surveillance Cameras

6. Speed Violation Detection System

7. Variable Message Sign boards

8. Speed Control Sign boards

9. Pedestrian Sign boards

10. Emergency Call Box (ECB) System

11. Traffic Command Centre with Real Time Traffic Analytics Platform

The schematic diagram below shows the systems envisaged under ITCS and the information flow across the systems to be integrated.
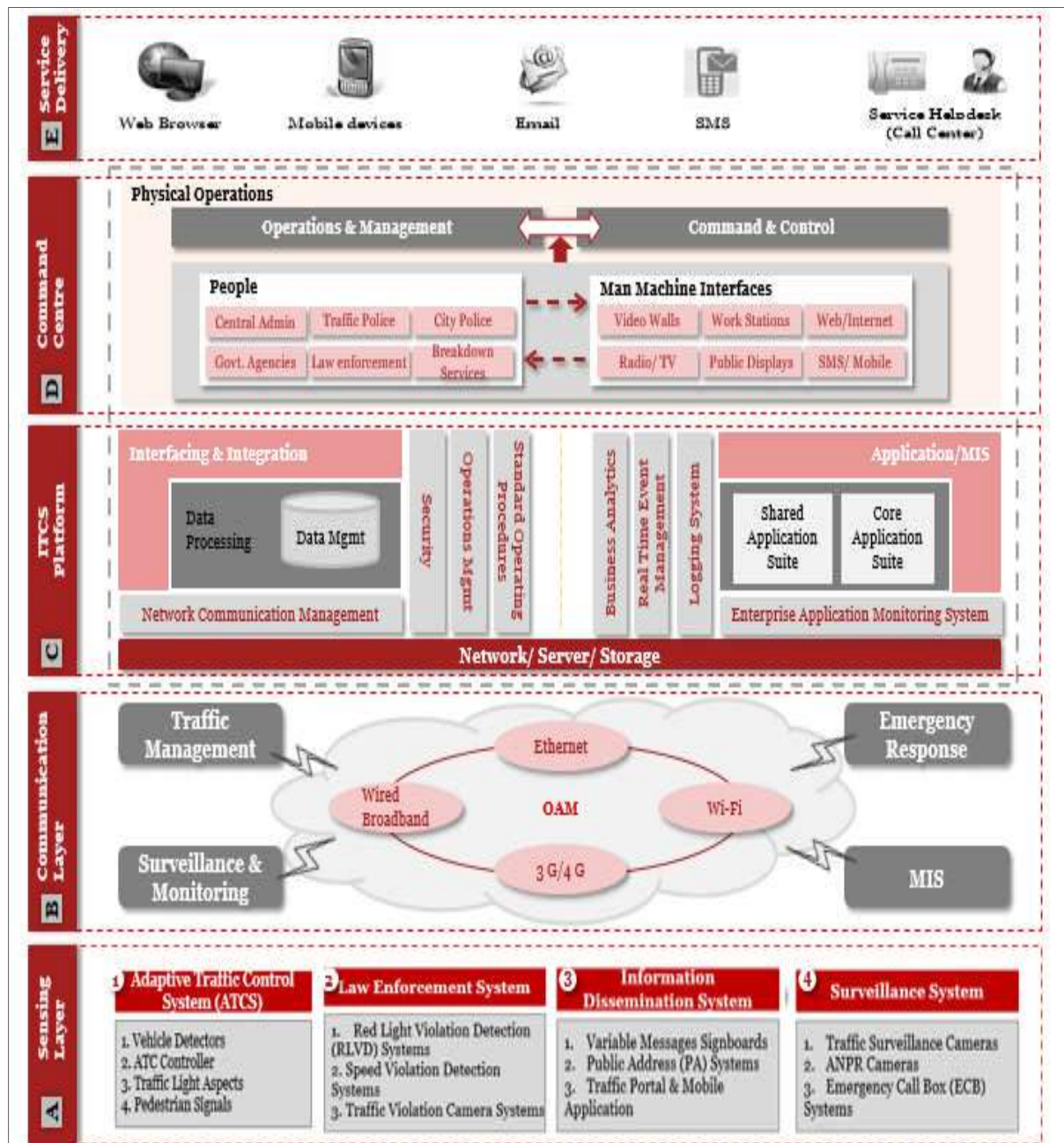
Figure: Logical Architecture of ITCS Solution
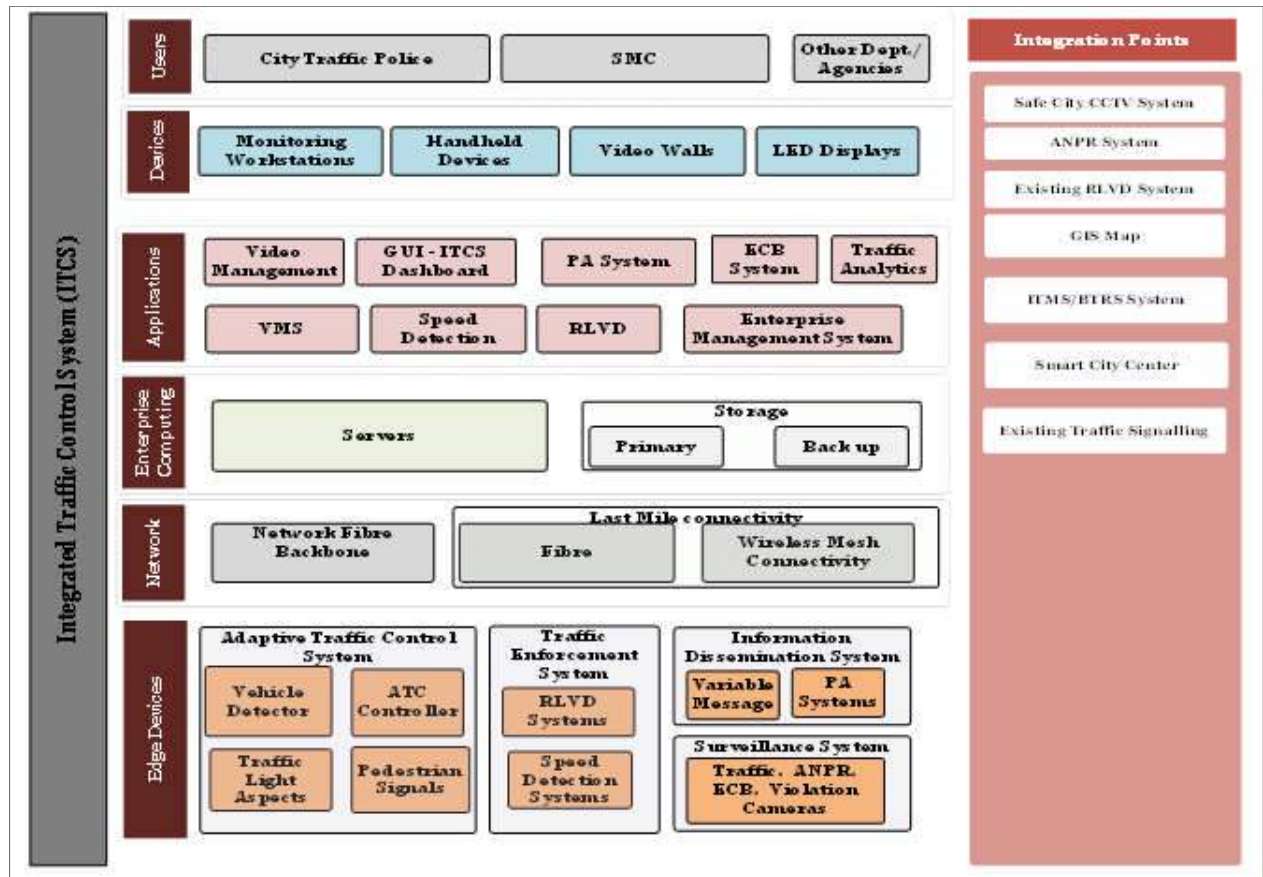
Figure 2: System Component Architecture of ITCS Solution

The SI'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 subsequent sections of this document:

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

   a. Assess existing traffic management systems, applications. Hardware, junction boxes etc. including traffic signaling systems and junction management

   b. Conduct feasibility study for finalization of detailed technical architecture, gap analysis and project plan

   c. Develop of traffic management plans for individual signal controls and groups of signal controllers along with pre-planned intervention strategies for special scenarios

d. Prepare plans for upgradation of traffic control systems to integrate existing traffic control systems and identify the action (replace/upgrade/modify) to be taken on the traffic control systems to achieve synchronization with ITCS applications

e. Conduct site surveys to identify need for junction improvement, junction static signage and other necessary site infrastructure

f. Obtain site Clearance obligations & other relevant permissions

2. **Design, Supply, Installation and Commissioning Field Equipment** which includes the following components:

a. Adaptive Traffic Control System (ATCS)

b. Red Light Violation Detection (RLVD) System

c. Automatic Number Plate Recognition (ANPR) System

d. Traffic Violation Cameras

e. Traffic Surveillance Cameras

f. Speed Violation Detection System

g. Variable Message Sign boards

h. Speed Control Sign boards

i. Pedestrian Sign boards

j. Emergency Call Box (ECB) System

3. Provisioning **Network Connectivity** which includes design, supply, installation and commissioning of network backbone connectivity for ITCS

a. Procurement of network bandwidth services for ITCS for initial one year operations which may be extended by SSCDL, if required.

b. Integrating live data streams with other existing systems such as E-Challan System, Surat Safe City project and proposed Smart City Center (SMAC). Integration and migration onto the city fiber network backbone envisaged under "Connected Surat" post one year of go-live or after go-live of Connected Surat project, whichever is later

4. Provisioning Hardware and Software Infrastructure which includes design, supply, installation and commissioning of IT Infrastructure at TCC and DC. This consist of:

    a. Basic Site preparation services

    b. IT Infrastructure including server, storage, other required hardware, application portfolio, licenses

    c. Centralized platform for traffic data analytics and signal optimization

    d. TCC infrastructure including operator workstations, joystick controller etc.

    e. Establishment of LAN and WAN connectivity at TCC and DC limited to scope of infrastructure procured for the project

    f. Application integration services with systems such as Mobility Command Center, Social Media Could Analytics (SMAC) center and Integrated Transit Management System (ITMS)

Note: As mentioned in previous section, there is Data center set up at Surat by exiting vendor. SSCDL intends to utilize these exiting Data Center infrastructure for the proposed ITCS. SI may consider to upgrade / use these exiting infrastructure while designing their solution.

5. **Capacity Building** for SCCDL, SMC and police department which includes preparation of operational manuals, training documents and capacity building support, including:

    a. Training of the city authorities, Traffic Police personnel and TCC operators on operationalization of the system

    b. Support during execution of acceptance testing

    c. Preparation and implementation of the information security policy, including policies on backup and redundancy plan

    d. Preparation of revised traffic signal control plans, alternate signal control plans, KPIs for performance monitoring of transport network, dashboards for MIS

    e. Developing standard operating procedures for operations management and other technical services to be rendered by TCC

    f. Preparation of system documents, user manuals, performance manuals, etc.

6. Warranty and Annual Maintenance which includes periodic maintenance services for the software, hardware and other IT infrastructure installed as part of ITCS project for a period of 5 years i.e. 1 year warranty & 4 years of CAMC and conducting periodic audits of the project from a third party, if required or instructed by SSCDL.

5.2. Geographical Scope of services

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

#	System Description	Locations
1.	New Adaptive Traffic Control Systems	146 Locations
2.	Up gradation of Existing Traffic Signaling Systems	27 Locations
3.	Integration from VAC to ATCS	94 Locations
4.	Speed Control Sign Boards	15 Locations
5.	Variable Message Sign Boards	20 Locations
6.	Red Light Violation Detection System at Intersection	25 Locations
7.	Speed Violation Detection Systems	15 Locations
8.	Traffic Violation Cameras	31 Locations
9.	Traffic Surveillance Cameras	55 Locations
10.	ANPR Cameras	17 Locations
11.	Emergency Call Box (ECB) System	20 Locations
12.	Traffic Command Center (TCC)	1 Location
13.	Pedestrian lamp heads	134 Location

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

5.3. Feasibility study for finalization of detailed technical architecture and project plan

After signing of contract, the Systems Integrator needs to deploy local team (based out of Surat) proposed for the project and ensure that a Project Inception Report is submitted to SSCDL which should cover following aspects:

1. Names of the Project Team members, their roles and responsibilities

2. Approach and methodology to be adopted to implement the Project (which should be in line with what has been proposed during bidding stage, but may have value additions / learning in the interest of the project).

3. Responsibility matrix for all stakeholders

4. Risks the SI anticipates and the plans they have towards their mitigation

5. Detailed project plan specifying dependencies between various project activities / sub-activities and their timelines

6.   Installation locations geo mapped preferably on google earth to visually identify the geographical area

The SI as part of the feasibility study shall also conduct a comprehensive As-Is study of the existing traffic signalling systems which are identified for upgradation, corridors & traffic junctions/intersections (identified for ITCS) during various time periods of day including peak and non-peak hours to establish the key performance indicators(KPI) for the ITCS projects. The KPIs of the study shall be included in the feasibility report. The following minimum parameters should be captured during the comprehensive study

1.   Volumes of vehicles moving in the road network within the area identified for ITCS implementation

2.   Vehicle type distribution

3.   Directional distribution

4.   Physical and visual characteristics of the area

5.   Travel times, delays between different points of the network

6.   Additional dependencies with respect to the available infrastructure and geometry at the junctions

7.   Any other relevant data which the SI anticipates will assist in establishing the benchmarks for the project

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

The System Integrator shall study the existing business processes, functionalities, existing traffic management systems and applications including existing ATCS and E-challan System, MIS reporting requirements. The System Integrator shall also identify the customizations/ workaround that need to be made to the available field devices and software solution and submit a document on the Gap analysis and customization/upgradation requirements. 1. The SI will also undertake a feasibility study to assess the reusability of the existing Junction boxes wherever possible and will submit a reusability report to SSCDL.

Additionally, the System Integrator should provide as part of feasibility report the detailed To-Be designs (Junction layout plans) specifying the following:

1.   High Level Design (including but not limited to) Application architecture, Logical and physical database design, Data dictionary and data definitions, ER diagrams and other data modelling documents and Physical infrastructure design for devices on the field

2. Application component design including component deployment views, control flows, etc.

3. Low Level Design (including but not limited to) Application flows and logic including pseudo code, GUI design (screen design, navigation, etc.), Database architecture, including defining data structure, data dictionary as per standards laid-down by Government of India/ Government of Gujarat

4. Location of all field systems and components proposed at the junctions, (KML /KMZ file plotted on GIS platform like google earth etc.)

5. Height and foundation of Traffic Signals and Standard Poles for Pedestrian signals, Height and foundation of Poles, cantilevers, gantry and other mounting structures for other field devices

6. Location of Junction Box

7. Location of Network Provider's Point of Presence (PoP)

8. Design of Cables, Ducts routing, digging and trenching

9. Electrical power provisioning

The SI shall also identify the customizations/ workaround that would be required for successful implementation and operation of the project. The feasibility report should take into consideration following guiding principles:

1. Scalability - Important technical components of the architecture must support scalability to provide continuous growth to meet the growing demand of the city traffic. The system should also support vertical and horizontal scalability so that depending on changing requirements from time to time, the system may be scaled upwards. There must not be any system imposed restrictions on the upward scalability in number of field devices. Main technological components requiring scalability are storage, bandwidth, computing performance (IT Infrastructure) and software / application performance. In quantitative terms, there may not be major change in number of Command Centers. However, command center should have to be shifted from TCC to ITMAC, once ITMAC gets operational. Number of Traffic Junctions could be even increased over 500 in 5 years' time.

2. Availability - Components of the architecture must provide redundancy and ensure that are no single point of failures in the key project components. Considering the high sensitivity of the system, design should be in such a way as to be resilient to technological sabotage. To take care of remote failure, the systems need to be

configured to mask and recover with minimum outage. The SI shall make the provision for high availability for all the services of the system.

3. Security - The architecture must adopt an end-to-end security model that protects data and the infrastructure from malicious attacks, theft, natural disasters etc. SI must make provisions for security of field equipment as well as protection of the software system from hackers and other threats. Using Firewalls and Intrusion detection systems such attacks and theft should be controlled and well supported (and implemented) with the security policy. The virus and worms attacks should be well defended with gateway level Anti-virus system, along with workstation level anti-virus mechanism. Furthermore, all the system logs should be properly stored & archived for future analysis and forensics whenever desired. SSCDL may carry out the Security Audit of the entire system post acceptance / operationalization through a Third Party Auditor (TPA). The following guidelines need to be observed for security:

   a. Build a complete audit trail of all activities and operations using log reports, so that errors in system – intentional or otherwise – can be traced and corrected.

   b. The most appropriate level of security commensurate with the value to that function for which it is deployed must be chosen

   c. Access controls must be provided to ensure that the system is not tampered or modified by the system operators.

   d. Implement data security to allow for changes in technology and business needs.

   e. The security of the field devices must be ensured with system architecture designed in a way to secure the field devices in terms of physical damage & unauthorized access.

4. Manageability - Ease of configuration, ongoing health monitoring, and failure detection are vital to the goals of scalability, availability, and security and must be able to match the scalability of the system

5. Interoperability - The system should have capability to take inputs from other third party systems as per situational requirements

6. Open Standards - System should use open standards and protocols to the extent possible without compromising on the security

7. Convergence - SMC has already initiated many projects which have state of the art infrastructure at field locations deployed under them. The ITCS System Integrator shall ensure leveraging the existing infrastructure for optimum utilization, and hence the SI shall submit a re-usability report for all IT , non IT Infrastructure during the

feasibility study period after signing of contract. Further, ITCS Infrastructure should be made scalable for future convergence needs. Under the smart city program, SMC has envisaged to create a state of the art infrastructure and services for the citizens of Surat, hence it is imperative that all infrastructure created under the project shall be leveraged for maximum utilization. Hence the System Integrator is required to ensure that such infrastructure will allow for accommodation of equipment's being procured under other smart city projects. Equipment like Junction Boxes and poles deployed under the ITCS project at the field locations will be utilized to accommodate field equipment's created under the other projects of SMC. The procedure for utilization of the infrastructure will be mutually agreed between the SMC and System Integrator

Sub-contracting / Outsourcing shall be allowed only for the work which is allowed as mentioned in the clause with prior written approval of SSCDL. However, even if the work is sub-contracted / outsourced, the sole responsibility of the work shall lie with the SI. The SI shall be held responsible for any delay/error/non-compliance etc. of its sub-contracted vendor. The details of the sub-contracting agreements (if any) between both the parties would be required to be submitted to SSCDL. Sub-contracting / outsourcing would be allowed only for work such as:

1. Passive Networking & Civil Work during implementation,

2. FMS staff for non- IT support during post-implementation

3. Services of professional architect for design of command / viewing centers

5.4. Site Clearance obligations & other relevant permissions

5.4.1. Survey and Commencement of Works

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

5.4.2. Existing Traffic Signal system

The infrastructure of existing traffic signal systems including the aspects, controllers etc. may need to be dismantled and replaced with the new systems which are proposed and required under the scope of the ITCS project. The infrastructure like poles, cantilevers, cabling, Aspects etc. should be reused to derive economies for the project. The dismantled infrastructure shall be delivered at the SSCDL designated location without damage at no extra cost.

5.4.3. Road signs

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

5.4.4. Electrical works and power supply

The SI shall directly interact with electricity boards for provision of mains power supply at all desired locations for ITCS field solution. The recurring electricity charges will be borne by SMC as per actual consumption. The SI shall be responsible to submit the electricity bill including connection charge, meter charge etc. to the electricity board directly. SI shall have to submit the challan of bill submission to SSCDL. SSCDL will reimburse the amount submitted to the SI after verification in next billing cycle.

5.4.5. Lightning-proof measures

The SI shall comply with lightning-protection and anti –interference measures for system structure, equipment type selection, equipment earthing, power, signal cables laying. The SI shall describe the planned lightning-protection and anti –interference measures in the feasibility report. Corresponding lightning arrester shall be erected for the entrance cables of power line, video line, data transmission cables. All crates shall have firm, durable shell. Shell shall have dustproof, antifouling, waterproof function & should capable to bear certain mechanical external force. Signal separation of low and high frequency; equipment's protective field shall be connected with its own public equal power bodies; small size/equipment signal lightning arrester shall be erected before the earthling. The Internal Surge Protection Device for Data Line Protection shall be selected as per zone of protection described in IEC 62305, 61643-11/12/21, 60364-4/5. Data line protection shall be used for security system, server data path and other communication equipment. Data line protection shall be installed as per zone defined in IEC 62305.Type 1 device shall be installed between zone 0B and zone 1. Type 2 devices shall be installed before the equipment in zone 2 and 3.

5.4.6. Earthing System

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

1. Earthing should be done for the entire power system and provisioning should be there to earth UPS systems, Power distribution units, AC units, etc. so as to avoid a ground

differential. SSCDL shall provide the necessary space required to prepare the earthing pits.

2. All metallic objects on the premises that are likely to be energized by electric currents should be effectively grounded.

3. There should be enough space between data and power cabling and there should not be any cross wiring of the two, in order to avoid any interference, or corruption of data.

4. The earth connections shall be properly made.

5. A complete copper mesh earthing grid needs to be installed for the server farm area, every rack need to be connected to this earthing grid. A separate earthing pit needs to be in place for this copper mesh.

6. Provide separate Earthing pits for Servers, & UPS as per the standards.

5.4.7. Junction Box, Poles and Cantilever

1. The System Integrator shall provide the Junction Boxes, poles and cantilever to mount the field sensors like the cameras, traffic sensors, traffic light aspects, active network components, controller and UPS at all field locations, as per the specifications given in the RFP.

2. The Junction Box needs to be appropriately sized in-order to accommodate the systems envisaged at the Junctions, and the SI should design the Junction box for 1.5 times the actual size the SI requires for utilization under the ITCS project.

3. The Additional 50% space in the Junction Box shall be utilized by SMC to accommodate any future requirements (i.e 8 port or higher Switches for "Connected Surat project" etc) under other projects.

4. The Junction Box for UPS with Battery bank needs to be considered separately

5. It should be noted that the SI would have designed the Junction box keeping in mind the scalability requirements of ITCS project, and the additional 50% volume needs to considered over and above such requirement

6. The junction box should be designed in a way that, separate compartment will be available for separate system (i.e. ITCS Controller, Mini server, Active component, etc.). Each compartments shall have lock & key facility. There should be provision made to integrate the systems if required.

5.4.8. Cabling Infrastructure

1. The System Integrator shall provide standardized cabling for all devices and subsystems in the field and Traffic Command Center. The SI shall study the reusability of existing cables already being used at the sites and submit a cable reusability report to SSCDL and identify which cables may be utilized and which ones require replacement to ensure successful operations of the system as per the SLAs defined. The report will also contain the cable migration plan.

2. SI shall ensure the installation of all necessary cables and connectors between the field sensors /devices assembly, outstation junction box, for pole mounted field sensors /devices the cables shall be routed down the inside of the pole and through underground duct to the outstation cabinet.

3. All cables shall be clearly labelled with indelible indications that can clearly be identified by maintenance personnel. The proposed cables shall meet the valid directives and standards.

4. Cabling must be carried out per relevant BIS standards. All cabling shall be documented in a cable plan by the SI.

5.4.9. Zebra crossing and stop line marking

1. The System Integrator shall be required to undertake the Junction markings including edge lines, centre line, pedestrian markings for Zebra crossing and stop line, lane markings, directional arrow markings etc. at all junctions as per Ministry of Road Transport and Highways (MORTH) and Indian Roads Congress (IRC) guidelines.

2. The SI shall submit as part of the feasibility study report, the detailed plan of undertaking this task including prior approvals for timings of road closure/ junction closure if required from the SMC.

3. The task of junction marking shall be carried out with minimum disruption of traffic, with appropriate signage informing the road users of any diversions/ road closures being undertaken.

4. The detailed guidelines to be complied for junction markings are provided in Annexure III.

5.5. Design, Supply, Installation, Upgradation & Commissioning of the Field Equipment

The Scope includes Supply, Installation, Commissioning and Customization (as required) of various field systems which include Adaptive Traffic Control System (ATCS) at Traffic Junctions, Traffic Surveillance Cameras, ANPR Cameras, ECB System, Speed Control Signs and Variable

Message Signs, Red Light Violation Detection system, Speed Violation Detection System, Traffic Violation cameras, and other IT infrastructure required for successful operation of the ITCS modules.

Based on the approved feasibility report, the SI will undertake the system configuration and customization in line with the changed, improved or specific requirements of Surat Traffic Police and SSCDL including:

1. The implementation methodology and approach must be based on the global best practices in-order to meet the defined Service Levels during the operation.

2. Best efforts have been made to define major functionalities for each sub- system of ITCS. However, System Integrator should not limit its offerings to the functionalities proposed in this RFP and is suggested to propose any functionality over and above what has already been given in this tender.

3. The SI shall design the field level equipment architecture to ensure maximum optimization of network equipment, poles, cantilever, mounting infrastructures, power supply equipment including, electric meters and junction box.

4. Finally approved/accepted solution for each component of ITCS shall be accompanied with "System Configuration" document and the same should be referenced for installation of ITCS at Junctions that are identified within the scope of this project.

5. The system integrator shall be required to submit a detailed installation report post installation of all the equipment at approved locations. The report shall be utilized during the acceptance testing period of the project to verify the actual quantity of the equipment supplied and commissioned under the project.

6. The SI shall be responsible for obtaining all permits and approvals necessary to install the ITCS components as per the approved design.

The sub-components included as part of the project for which field equipment needs to be deployed and integrated are given in the subsequent sections.

5.5.1. Adaptive Traffic Control System (ATCS)

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

1. Preparation of Solution Architecture and Gap Analysis as per project blueprint to develop a final BOQ for new installation and upgradation of existing traffic signaling systems.

2. Installation of vehicle detectors, controllers, Traffic light aspects, poles, cantilevers, Junction Box and other required accessories for successful operation of the ATCS for SSCDL, Surat Traffic Police

3. Upgradation of existing traffic signaling systems with installation of necessary UPS and power back up systems at traffic junctions

4. Utilization of the existing infrastructures including poles, Aspects, cantilevers, cabling, ducts etc. as per approved feasibility report

5. SI is required to consider existing Aspects of 27 Non BRTS junctions while upgradation of the signals. The specifications is mentioned in Annexure III.

6. Integration of ATCS (both existing and new) field infrastructures with existing ATCS software applications

7. Configuration of traffic signal at each of the junction along with development of signal control plan for individual operations, coordinated signal plan for the junction in sync with the area wide signal plan for different operating conditions. The operating conditions may include different peak and off-peak conditions, special events, contingency plans etc.

8. Third Party Audit of the ATCS implementation and its performance evaluation as per SLA's defined in the RFP.

5.5.2. Red Light Violation Detection (RLVD) System

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

1. The SI shall install the RLVD Systems at 25 traffic junctions across the city. This system shall capture the infractions of Red light and stop line violations at these junctions.

2. The SI 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 SI. The SI 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 SI shall have the capability to seamlessly integrate with the exiting E-Challan system implemented by Surat Traffic Police as part of this

project. SSDL shall facilitate to get access to the Driver and Vehicle database. Bidder shall be required to access the same through use of appropriate APIs.

4. The SI shall be responsible for providing all the necessary IT infrastructure for analysis, storage & retrieval of the infraction information at TCC or any other location as specified in the RFP.

5. For more details on technical and functional specifications of Red Light Violation Detection (RLVD) system, SI should refer to Annexure II, and Annexure III for Functional and Technical specifications respectively.

5.5.3. Speed Control Signs and Variable Message Sign Boards

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

1. The SI shall install IP based VMS boards on approximate 20 locations across city of Surat. These VMS boards shall have different characteristics depending upon the location and purpose of installation. VMS board displays are to be controlled by Surat Traffic Police personnel from the TCC. The purpose of the VMS boards is to provide the commuters with information about traffic conditions and alternate routes in case of high traffic on roads.

2. These VMS will also work as mid-block VMS and will be integrated with traffic sensor to visually depict the levels of congestion on the corridor.

3. The SI shall install Speed Control Signs at 15 defined locations for displaying information on the permissible speed limits on the road corridor.

4. The SI, in consultation with Traffic Police can propose alternate locations apart from the locations mentioned in this RFP for installing the VMS boards where their effectiveness in communicating information about traffic conditions in Surat will be maximized.

5. Surat Traffic Police shall review and approve the proposed locations. The SI shall install the VMS boards on the approved locations.

6. For more details on technical and functional specifications of Speed Control Signs and VMS boards, the SI should refer to Annexure II and Annexure III for functional requirements and technical specifications

5.5.4. Speed Violation Detection System

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

1. The SI shall install the Speed Violation Detection Systems at 15 locations across the city. At the time of BoQ finalization SI shall also survey the location of exiting cameras and suggest if there are overlapping of locations mentioned in the RFP. This system shall capture the infractions of speed violations at these locations.

2. The SI 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 SI. The SI 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 SI shall have the capability to seamlessly integrate with the exiting E-Challan system implemented by Surat Traffic Police as part of this project.

4. The SI shall be responsible for providing all the necessary IT infrastructure for analysis, storage & retrieval of the infraction information at TCC or any other location as specified in the RFP.

5. For more details on technical and functional specifications of Speed Violation Detection system, SI should refer to Annexure II, and Annexure III for Functional and Technical specifications respectively.

5.5.5. 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 SI shall install additional fixed cameras for detection of violations like parking in "No Parking Areas", wrong side entry points at 31 locations across the city.

2. The SI 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 SI. The SI 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 SI shall have the capability to seamlessly integrate with the exiting E-Challan system implemented by Surat Traffic Police as part of this project.

4. The SI shall be responsible for providing all the necessary IT infrastructure for analysis, storage & retrieval of the infraction information at TCC or any other location as specified in the RFP.

5. For more details on technical and functional specifications of Traffic Violation Detection system, SI should refer to Annexure II, and Annexure III for Functional and Technical specifications respectively.

5.5.6. Traffic surveillance system

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

1. The SI shall install Traffic Surveillance Cameras for traffic monitoring and management at 55 junctions across the city. SI shall also survey the location of exiting cameras and suggest if there are overlapping of locations mentioned in the RFP.

2. The SI shall undertake due diligence for selection and placement of traffic surveillance cameras to ensure the full coverage of the traffic junction along with all associated junction arms, accuracy of the information captured on the field and for rugged operations.

3. The SI shall design, supply, and install the traffic surveillance cameras as defined in the RFP, all wiring connections for the system shall be installed by the SI. The SI shall supply all of the necessary equipment for the camera operations including camera housings and mountings, camera poles, switches, cabling, and shall make the final connections to the junction box.

4. The SI shall be responsible for providing all the necessary IT infrastructure for monitoring, recording, storage & retrieval of the infraction information at TCC or any other location as specified in the RFP.

5. For more details on technical and functional specifications of Traffic Surveillance Detection system, SI should refer to Annexure II, and Annexure III for Functional and Technical specifications respectively.

5.5.7. ANPR Cameras

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

1. The SI shall install the ANPR Cameras at 17 traffic junctions across the city. SI shall also survey the location of exiting cameras and suggest if there are overlapping of locations mentioned in the RFP. This system shall automatically capture the license number plate of the vehicle at these junctions.

2. The SI 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 SI. The SI shall supply all of the necessary equipment for the camera and local processing system, including but not limited to: computers, local storage, and ancillary camera equipment, camera poles, warning signs and shall make the final connections to the camera.

3. The SI shall be responsible for providing all the necessary IT infrastructure for detection, analysis, storage & retrieval of the infraction information at TCC or any other location as specified in the RFP.

4. For more details on technical and functional specifications of ANPR Cameras, SI should refer to Annexure II, and Annexure III for Functional and Technical specifications respectively.

5.5.8.E-Challan Devices

The SI is required to supply more than 125 devices along with e-Challan application for spot challan issuance. The SI is required to integrated handheld e-Challan application with existing e-Challan application which is currently being used by Police Department.

5.6. Scope of Integration for ITCS Component.

#	System	Integration	Primary User			Secondary User		
			Entity	Data Requirement	Purpose	Entity	Data Requirement	Purpose
1	Adaptive Traffic Control System (ATCS)	Web Portal, Mobile App & existing ATCS Software	Traffic Police	Real time traffic density at each traffic junction.	Reduce Transit Time. Smooth Flow of traffic. Centralized Traffic Management	SMC	Real time traffic density at each traffic junction.	Traffic Analysis for Infrastructure development to reduce the transit time and Maintenance of Traffic Signals
2	Red Light Violation Detection (RLVD) System	Existing E Challan Software of Police Department	Traffic Police	Snap shot & video Clip of vehicle violating Traffic signal rules. Registration number of the vehicle.	To Generate E Challan for traffic violation.	SMC	Snap Shot & Video Clip	Data storage as per RFP, analysis or monitoring of civic services
3	Automatic Number Plate Recognition (ANPR) System	Centralized Database of Police department (Hot listing database available)	Police Department	Registration Number of the vehicle. Over view snap shot of the vehicle & Video Clip of the vehicle	Database of the vehicle entering the city. Generate alert for suspicious vehicle. Track the vehicle in case of crime	SMC	Snap Shot & Video Clip	Data storage as per RFP
4	Traffic Violation Cameras	Existing E Challan Software of Police Department	Traffic Police, Police Department	Snap shot & video Clip of vehicle violating	To Generate E Challan for traffic violation.	SMC	Snap Shot & Video Clip	Data storage as per RFP, analysis or monitoring of civic services

#	System	Integration	Primary User			Secondary User		
			Entity	Data Requirement	Purpose	Entity	Data Requirement	Purpose
				traffic rules like illegal parking, wrong side entry. Live Video Feeds				
5	Traffic Surveillance Cameras	Video Management Software at Police Department and with Face Recognition System of Police Department	Traffic Police	Live Video Feeds	Monitoring, Face Recognition	SMC	Live Video Feeds	Monitoring for unauthorized utilization for government property and other civic services
6	Speed Violation Detection System	Existing E Challan Software of Police Department	Traffic Police	Snap shot & Video clip of the vehicle violating speed limit	To Generate E Challan for speed violation.	SMC	Snap Shot & Video Clip	Data storage as per RFP

5.7. Design, Supply, Installation and Commissioning of Network & Backbone Connectivity for ITCS

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

Smart City

2. It is envisaged that the ITCS system shall leverage City Network Backbone infrastructure that is being created under "Surat Connected" project under other smart city initiatives

3. However, until the "Surat Connected" network is established in the city, it is proposed that the SI should procure bandwidth as a service for a period of 1 year post go live of ITCS project of go-live of "Connected Surat" project, whichever is later, in order to meet the requirements as defined within the service level agreement. The bidder should provide connectivity over MPLS network till the ITCS system will migrated on Connected Surat network.

4. It will also be the responsibility of the SI after the "Surat Connected" Backbone is established to migrate the systems to this network

5. The provisioning of the PoPs for the "Surat Connected" network at the Junction and other field locations will be mutually agreed upon by the SMC and the SI for the ITCS project

6. The SI should provide a detailed network architecture of the overall system, incorporating findings of site survey exercise. The network so envisaged should be able to provide real time data streams to the TCC. All the components of the technical network architecture should be of industry best standard and assist SI in ensuring that all the connectivity SLAs are adhered to during the operational phase.

7. The SI shall prepare the overall network connectivity plan for this project. The plan shall comprise of deployment of network equipment at the junctions to be connected over network, any clearances required from other government departments for setting up of the entire network. The network architecture proposed should be scalable and in adherence to network security standards. It is necessary that at least 80% of the proposed last mile connectivity should be wired. Last Mile to be defined as "the access link from the service provider's PoP – (as per Telco Standards) to the field device".

8. The SI shall also provide network architecture for integration & migration of ITCS system with "Connected Surat project".

9. SIs are also required to do the estimation of bandwidth requirements considering following benchmark parameters:

#	ITCS component	Consideration
1	ATCS	• Minimum 1 MB per controller
2	Speed Control Signs & Variable Message Sign	• Minimum 1 MB for each location

#	ITCS component	Consideration
	Boards	
3	Traffic Surveillance Cameras	• Resolution: 1920x1080 • Frame Rate: 30 fps
4	Traffic Violation Cameras	• Resolution: 1920x1080 • Frame Rate: 30 fps
5	RLVD & ANPR	• Video footage of incident (t-5 seconds to t+5 seconds, where t is time of incident) at required high resolution • Minimum 4 Images of violating vehicle along with Number plate
6	Speed Violation	• Minimum 4 Images of violating vehicle along with Number plate

1. The actual bandwidth requirement to cater the above mentioned bandwidth parameters and to meet SLAs would be calculated by the SI and the same shall be clearly proposed in the technical proposal with detail calculations. SSCDL also requires the SI to meet the parameters of video feed quality, security & performance and thus SIs should factor the same while designing the solution. SSCDL reserves its right to ask the Systems Integrator to increase the bandwidth if the provided bandwidth is not sufficient to give the functionality of the system mentioned in the RFP and adhere to the SLAs.

2. In case the Telecommunication guidelines of Government of India require the purchaser to place Purchase Order to the Service Provider for bandwidth, SSCDL shall do so. However, Systems Integrator shall sign a contract with Telecom Service Provider(s) and ensure the performance. SSCDL shall make payments to the Systems Integrator.

3. The system integrator shall be required to submit a detailed installation report post installation of all the equipment at approved locations. The report shall be utilized during the acceptance testing period of the project to verify the actual quantity of the equipment supplied and commissioned under the project.

4. The SI shall develop a migration plan to switch the ITCS network to the City Network Backbone and implement the migration procedure within one month of operationalization of the "Surat Connected" project.

5.   The system integrator shall be required to submit a detailed migration report post switching of all the field equipment.

5.8. Design, Supply, Installation and Commissioning of IT Infrastructure at TCC and DC

1.   It is proposed that the SI shall provide the IT hardware infrastructure at the DC for successful operations of the systems. The Primary DC will be at TCC (Space, AC & furniture to be provided by SSCDL for data center). Once the Integrated Transport-Mobility Management Centre (IT-MAC) in Surat is operational, then the SI, shall migrate to the ITMAC. SI has to ensure that redundancy is provided for all the key components to ensure that no single point of failure affects the performance of the overall system. It will be SI's responsibility to:

   a.   Supply, Install and Commission of IT Infrastructure including site preparation in TCC and DC

   b.   Supply viewing screen and workstations at 7 Zone offices.

   c.   Establish LAN and WAN connectivity at TCC, DC, Police Control room and Zone offices

2.   Along with TCC the following systems shall also be available for monitoring at the 7 Zone offices of SMC and police control room:

   a.   Surveillance feeds based on ITCS cameras available in the zone jurisdiction

   b.   Live report on the status of Junctions and traffic signals in the zone jurisdiction

3.   Data Centre should provide a dedicated rack space for the ITCS Infrastructure. Racks to be caged.

4.   Data Centre developed by SI should be as per Telecommunications Infrastructure Standard for Data Centers

5.   Access to the Data Centre Space where the ITCS Infrastructure is hosted should be demarcated and physical access to the place would be given only to the authorized personnel. Networking & Security Infrastructure and other associated IT Components.

6.   The SI shall provide system integration services to customize and integrate the applications procured through the projects. The ITCS applications proposed by the SI should have open APIs and should be able to integrate and share the data with other third party systems already available or coming up in the near future

7. As part of preparing the final bill of material for the physical data center, the successful SI will be required to list all passive & active components required in the data centers.

8. The bill of material proposed by the successful SI will be approved by SSCDL for its supply and installation. Indicative IT Infrastructure to be commissioned as part of the ITCS project at Data Centre are as under:

   a. Servers (inclusive of OS) - Application Servers, Database Server, Video Recording Server, Video Management Server, Enterprise Backup Server, Domain Controller, Failover Servers for application and Recording Servers

   b. Application & System Software (with necessary customization) - Red Light Violation Detection application, Speed Violation Detection application, Variable message Sign Board application, ECB System application, ANPR application Traffic Violation Analytics software application, Traffic Analytics application Platform for Citizen Decision Support System

   c. RDBMS (if required)

   d. Anti-virus Software

   e. EMS software

   f. Primary Storage Solution

   g. Storage Management Solution

   h. Core Router

   i. Switches (L2 & L3 Switches)

   j. KVM Switches

   k. Firewall

   l. Racks (Caged)

   m. All required Passive Components

   n. Any other Server required to the cater to the scope of work mentioned in this

9. The above are only indicative requirements of IT & Non-IT Infrastructure requirements at DC. The exact quantity and requirement shall be proposed as part of the technical proposal of the SI.

10.   As mentioned in previous section, there is Data center set up at Surat by exiting vendor. SSCDL intends to utilize these exiting Data Center infrastructure for the proposed ITCS. SI may consider to upgrade / use these exiting infrastructure while designing their solution.

11.   The SI shall prepare the overall data centers establishment & their operational plan for this project. The plan shall comprise of deployment of all the equipment required under the project. The implementation roll-out plan for setting up the data centers shall be approved by SSCDL. The detailed plan shall be also comprise of the scalability, expandability and security that such data centers will implement under this project.

12.   The SI shall also establish a state of the art Traffic Command Centre at a location specified by SMC in Surat, the key components of the TCC will be as follows:

   a.   Operator workstations

   b.   Active Networking Components (Switches, Routers)

   c.   Passive Networking Components

   d.   Electrical Cabling and Necessary Illumination Devices

   e.   Office Workstations

   f.   UPS (1 hour backup)

13.   The SI shall also establish monitoring stations at 7 zone offices in Surat, the key components of the TCC will be as follows:

   a.   Operator workstations

   b.   UPS (1 hour backup)

   c.   Furniture and fixtures, if required

14.   The system integrator shall be required to submit a detailed installation report post installation of all the equipment at approved locations. The report shall be utilized during the acceptance testing period of the project to verify the actual quantity of the equipment supplied and commissioned under the project.

5.9. Preparation and implementation of the Information security policy, including policies on backup

The SI shall prepare the Information Security Policy for the overall Project and the same would be reviewed and then finalized by SSCDL & its authorized committees. The Security policy needs to be submitted by the System Integrator within 1st quarter of the successful Final Acceptance Tests.

5.10. Capacity Building and Training

Capacity Building is an important aspect of this Project, the SSCDL and Traffic Police expects the SI to undertake it in a very professional manner. SI has to conduct a proper training need analysis of all the concerned staff and draw up a systematic training plan in line with the overall Project plan. For all these training programs the SI has to provide necessary course material and reference manuals (user/maintenance/ administration) along with training schedules for all phases. The training shall held at various office/department locations as finalised by SSCDL and Traffic Police Department.

Trainings would be of three types for different phases of the Project:

1. Functional Training: This training would focus on the use of the software of the various ITCS components at Traffic Command Center, so that the users are aware of all the operations of the ITCS and are able to implement the overall process defined by the SMC/SSDCL for optimum use of the system. Broad training requirement defined for the purpose of calculation of effort is as follows:

    a. Training program of 1 batch (of 20 personnel) of 2 days every 2 months

2. Administrative Training: This training would focus on the administration of ITCS solution and server infrastructure and would be imparted to about 8 – 10 staff identified by the SMC/SSDCL . SI shall also provide additional training programme of 1 batch (of 8 - 10 personnel) of 5 days every 6 months. Expected training time would be 40 hrs (5 days of 8 hrs each).

3. Senior Management Training: This training would focus on how to use the ITCS for day-to-day monitoring by the Sr. Management and access various exception reports. Broad training requirement defined for the purpose of calculation of effort is as follows:

    a. Initial Training of approx. 40 persons (i.e. about 4 batches of 10 officers each)

    b. Additional training program of 1 batch (of 10 personnel) of 2 days every 3 months

    c. Expected training time of 8 hrs.

4. Note: Additional Training requirements will be assessed by SMC, SSCDL and Police Department along with SI when such requirements arise.

5.   Other requirements to be fulfilled by the SI with respect to training are as follows:

  a. Prepare the training material in consultation with Police Department & its authorized committees. Detailed training manuals would be prepared by the SI prior to the start of the training. Master copies of all training material should be submitted to the Authority for approval.

  b. One Hard Copy & One Soft Copy of the training material shall be given by the SI to all the trainees. The location for the Administrative & Sr. Management Training would be decided subsequently.

  c. Successful SI should ensure that the knowledge transfer to the Police Department staff happens effectively post training.

5.11. Factory Testing

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

  1. Cable
  2. Pole
  3. Signal Aspects

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

5.12. Acceptance Testing

The SSCDL and Traffic Police shall review and finalize the detailed acceptance test plan proposed by the SI. The SSCDL and Traffic Police would also conduct audit of the process, plan and results of the Acceptance Test carried out by the SI for both IT & non-IT components. The SSCDL and Traffic Police would issue certification of completion for which SSCDL and Traffic Police shall verify availability of all the defined services as per the contract signed between the SI and SSCDL. The SI shall be required to demonstrate all the services, features, functionalities as mentioned in the agreement.

All acceptance testing, project review and monitoring shall be enabled through a Project Management Unit (PMU) nominated by SSCDL and Traffic Police prior to certification by SSCDL and Traffic Police.

Commissioning shall involve the completion of the site preparation, supply and installation of the required components and making the Project available to the SSCDL and Traffic Police for carrying

out live Operations and getting the acceptance of the same from the SSCDL and Traffic Police. Testing and Commissioning shall be carried out before the commencement of Operations.

5.12.1. Partial Acceptance Testing

Partial Acceptance Test shall involve scrutiny of documents for various IT / Non-IT components to verify if the specifications conform to the technical and functional requirements mentioned in the Tender and subsequent corrigendum. SMC reserves right to conduct physical inspection of the equipment delivered to ensure that they arrive at the sites in good condition and are free from physical damage and incomplete shipments and shall return the products to the supplier at the supplier's expenses if required quality is not maintained. Physical inspection of hardware will also include physical checking and counting of the delivered equipment in presence of the Successful SI. This equipment will only be acceptable as correct when each received item corresponds with the checklist that will be prepared by the Successful SI prior to shipment. Any shortfalls in terms of number of items received may render the delivered equipment incomplete.

5.12.2. Final Acceptance Testing

The final acceptance shall cover 100% of the SURAT ITCS Project, after successful testing by the SSCDL and Traffic Police or its PMU; a Final Acceptance Test Certificate (FAT) shall be issued by the SSCDL and Traffic Police to the SI.

Prerequisite for Carrying out FAT activity:

1. Detailed test plan shall be developed by the SI and approved by SSCDL . This shall be submitted by SI before FAT activity to be carried out.

2. All documentation related to SURAT ITCS Project and relevant acceptance test document (including IT Components, Non IT Components etc.) should be completed & submitted before the final acceptance test to the SSCDL and Traffic Police.

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 SURAT ITCS Project supplied components.

The FAT shall include the following:

1. All hardware and software items must be installed at respective sites as per the specification.

2. Availability of all the defined services shall be verified.

3. The SI shall be required to demonstrate all the features / facilities / functionalities as mentioned in the RFP.

4. The SI shall arrange the test equipment required for performance verification, and will also provide documented test results.

5. The SI shall be responsible for the security audit of the established ITCS system to be carried out by a certified third party as agreed by SSCDL and.

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

5.13. System Documents and User Manuals

The SI shall provide documentation, which follows the ITIL (Information Technology Infrastructure Library) standards or IEEE/ISO Acceptable Documentation Standards. This documentation should be submitted as the project undergoes various stages of implementation and provide all traceability documentation on changes done on the IT components during the course of the implementation of the solution.Indicative list of documents include:

1. Project Commencement: Project Plan should provide micro level activities with milestones & deadlines.

2. Delivery of Material: Original Manuals from OEMs.

3. Training: Training Material will be provided which will include the presentations used for trainings and also the required relevant documents for the topics being covered.

4. Process Documentation: The SI shall be responsible for preparing process documentation related to the operation and maintenance of each and every component of the ITCS Project. The prepared process document shall be formally signed off by SSCDL and Traffic Police before completion of final acceptance test.

   a. The SI shall document all the installation and commissioning procedures and provide the same to the SSCDL within one week of the commissioning of SURAT ITCS.

b. The SI shall submit a complete set of Single Line diagram, a complete cabling system layout (as installed), including cable routing, telecommunication closets and telecommunication outlet/ connector designations. The layout shall detail locations of all components and indicate all wiring pathways.

c. Manuals for configuring of switches, routers, etc shall be provided by the selected SI.

The SI shall be responsible for documenting configuration of all devices and keeping back up of all configuration files, so as to enable quick recovery in case of failure of devices.

5.14. Operations and Maintenance for a period of 5 years

Success of the Project would lie on how professionally and methodically the entire Project is managed once the implementation is completed. From the System Integrator perspective too this is a critical phase since the quarterly payments are linked to the SLA's in the post implementation phases. System Integrator thus is required to depute a dedicated team of professionals to manage the Project and ensure adherence to the required SLAs. SI shall provide operations and maintenance services for the software, hardware and other IT and Non-IT infrastructure installed as part of ITCS project for a period of 5 years i.e. 1 year warranty & 4 years of comprehensive AMC. Warranty period of the product supplied under ITCS project i.e hardware, software, IT/Non-IT etc., will be considered after issue of last request order to the SI & entire ITCS system will gets operational.

5.14.1. Project Management & Facilities Management Services

The SI will be required to provide facilities management services to support the SSCDL and Police Department officials in performing their day-to-day functions related to this system.

SI is required to depute a dedicated, centralised project management and technical team (except for Project Director) for the overall Project management and interaction with SMC, SSCDL and Police Department. Indicative resource requirement for this centralised administration of the Project is as follows. The Project Director shall visit and conduct the review meeting with SSCDL and other stakeholder once in a month till completion the Project duration.

| # | Role | Total number of Manpower | Shifts | | |
			1	2	3
1	Project Director	1	√		

#	Role	Total number of Manpower	Shifts		
			1	2	3
2	Project Manager	1	√		
3	Technical Expert- Traffic Command Centre	1		√	
4	Technical expert- Intelligent Transport Systems	1	√		
5	Technical Expert – Network & Security	1		√	
6	Technical Executive – Server, Storage, EMS & Software Applications	1	√		
7	TCC Operators (refer section 5.13.2)	5	√	√	√

The above-mentioned manpower requirement is indicative and if the SI believes that to meet the SLAs, additional capacity is required, the same may be provided by the SI as scope of the project. The minimum qualification criteria are provided in Annexure VI.

5.14.2. Provision of the Operational Manpower to view the feeds at Traffic Command Center

The SI is required to provide suitable manpower to monitor the data feeds at Traffic Command Centre and support SMC and Traffic Police Department in operationalisation of the ITCS project. The exact role of these personnel and their responsibilities would be defined and monitored by SMC and Police Department personnel. System Integrator 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. SMC 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. System Integrator shall have to replace any person, if not found suitable for the job.

5. All the manpower shall have to undergo training from the System Integrator for at least 15 working days on the working of ITCS project and Traffic Command Center. Training should also cover dos & don'ts and will have few sessions from SMC and Traffic Police Department officers on right approaches for monitoring the feeds &

providing feedback to SMC, Traffic Police Personnel 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 shall be prepared during implementation which shall specify detail responsibilities of these resources and their do's & don'ts.

The Current estimation of the man-power required from the SI for viewing of the data feeds is as follows:

#	Description	Quantity
1.	Operational Manpower at Traffic Command Centre (At least 5 in shift 1 and for other shift SI can decide on no but not less than 2)	5

The supervisors required for operationalization of the ITCS project will be provided by SMC, and Traffic Police department as per requirements.

5.14.3. Basic Infrastructure Services

Following services shall be provided by the SI under the basic infrastructure services:

1.   Ensure availability of the ITCS infrastructure (both physical and IT) including but not limited to Power, Cooling, Racks, Storage and other peripheral equipment installed at the time of Project commissioning as per the SLAs.

2.   Ensure scalability in terms of availability of racks and supporting infrastructure.

3.   Proactive and reactive maintenance, repair and replacement of defective components (physical and other peripheral IT infrastructure) installed for the Project through this RFP. The cost for repair and replacement shall be borne by the SI.

4.   Any component (Physical & IT installed at the time of Project commissioning) that is reported to be faulty / non-functional on a given date should be either fully repaired or replaced by temporary substitute (of equivalent configuration) within the time frame agreed upon in the Service Level Agreement (SLA).

5.   Proactive monitoring of the entire basic infrastructure installed.

6. SI shall maintain records of the maintenance of the basic infrastructure and shall maintain a logbook on-site that may be inspected by the SSCDL and Traffic Police at any time.

5.14.4. Network Monitoring Services

The activities shall include:

1. SI shall provide services for management of SURAT ITCS Project to maintain performance at optimum levels on a 24 x 7 basis.

2. SI shall monitor and administer the network.

3. SI shall create and modify VLAN, assignment of ports to appropriate applications and segmentation of traffic.

4. SI shall carry out break fix maintenance of the LAN cabling or maintenance work requiring civil work.

5.14.5. Integration Testing

This shall be a black-box testing role primarily to ensure that the application to be deployed does not disrupt the SURAT ITCS operations and affect other SURAT ITCS infrastructure in terms of performance and security. The technical tasks to be carried out shall be as follows:

1. Functional Testing: Ensuring that the application functionality as described by the SSCDL and Traffic Police works adequately. The functional testing of application will necessarily be minimal as this is a core responsibility of the Supplier.

2. Performance Testing: Ensuring that the application meets expressed performance requirements on the SURAT ITCS servers by using performance test tools and performance monitoring tools.

3. Security Testing: Testing for exploitable application security weaknesses that undermine the application security or the security of the infrastructure.

5.14.6. Vendor Management Services

The activities shall include:

1. Coordination with all the project stakeholders to ensure that all SURAT ITCS activities are carried out in a timely manner.

2.   SI shall coordinate and follow-up with all the relevant vendors to ensure that the issues are resolved in accordance with the SLAs agreed upon with them.

3.   SI shall also ensure that unresolved issues are escalated to respective departments.

4.   SI shall maintain database of the various vendors with details like contact person, telephone nos., escalation matrix, response time and resolution time commitments etc.

5.   SI shall draw a consolidated quarterly SLA performance report across vendors for consideration of the SSCDL and Traffic Police.

5.14.7. Network Management

The objective of this service is to ensure continuous operation and upkeep of the LAN & WAN infrastructure of the project including all active and passive components. The selected SI shall be responsible to coordinate with Network Service Provider for network related issues between TCC, DC, and Traffic Junctions. The services to be provided for Network Management include:

1.   Ensuring that the network is available 24x7x365 as per the prescribed SLAs for the initial 1 year of operations

2.   Attending to and resolving network failures and snags.

3.   Support and maintain the overall network infrastructure including but not limited to LAN passive components, routers, switches etc.

4.   Configuration and backup of network devices including documentation of all configurations.

5.   24x7x365 monitoring of the network to spot the problems immediately.

6.   Provide information on performance of Ethernet segments, including capacity utilization and error statistics for the segment and the top-contributing hosts, WAN links and routers.

7.   Ensuring timely information to the SMC and Surat Traffic police pertaining to issues of Network Backbone under "Surat Connected" project

5.14.8. Physical Infrastructure Management and Maintenance Services

All the devices that will be installed in the ITCS Project as part of the physical infrastructure should be SNMP enabled and shall be centrally and remotely monitored and managed on a

24x7x365 basis. Industry leading infrastructure management solution should be deployed to facilitate monitoring and management of the ITCS Infrastructure on one integrated console. The physical infrastructure management and maintenance services shall include:

1. Proactive and reactive maintenance, repair and replacement of defective components (IT and Non-IT/ Hardware and Software). The cost for repair and replacement shall be borne by the SI.

2. The SI shall have to stock and provide adequate onsite and offsite spare parts and spare component to ensure that the uptime commitment as per SLA is met. To provide this service it is important for the SI to have back to back arrangement with the OEMs. The SI needs to provide a copy of the service level agreement signed with the respective OEMs.

3. Component that is reported to be down on a given date should be either fully repaired or replaced by temporary substitute (of equivalent configuration) within the time frame indicated in the Service Level Agreement (SLA). In case the selected SI fails to meet the above standards of maintenance, there will be a penalty as specified in the SLA.

4. The selected SI shall also maintain records of all maintenance of the system and shall maintain a logbook on-site that may be inspected by the SSCDL and Traffic Police at any time.

5.14.9. License Metering / Management

The SI 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 TCC, and DC. This may be carried out through the use of standard license metering tools.

5.15. Hand-over of the system at the end of contractual period along with all documentation required to operate and maintain the system

System Integrator will supply to the SMC and Traffic Police Department the following before the expiry of the contract:

1. Information relating to the current services rendered and data relating to the performance of the services; Entire documentation relating to various components of the Project, any other data and confidential information related to the Project;

2. All other information (including but not limited to documents, records and agreements) relating to the products & services related to the project to enable Police Department and its nominated agencies, or its replacing Successful SI to carry out due diligence in order to

transition the provision of the Project Services to Police Department or its nominated agencies, or its replacing Successful SI (as the case may be).

5.16. Other

1. SI to ensure that for operation and maintenance team has the uniform with the identity card, safety shoes, helmet, Neon Jackets etc.

2. SI will have to carry his own four-wheeler and a ladder of 15 feet length for carry out implementation and maintenance work (including transportation of items required for Project) during the Contract Period. All the expenses pertaining to four wheeler such as driver's expense, fuel, lubricants, maintenance etc., will have to be borne by the SI. The SI will have to keep minimum 1 number of loaded 4 wheeler for maintenance & minimum 1 number of 4 wheeler for supervision. SMC/SSCDL may ask bidder to arrange additional vehicle if required. The vehicle & related accessories should follow RTO norms of Government of Gujarat.

3. SI will pay the charges related to Electric Meter (if installed new) and recurring electricity charges. These charges will be then reimbursed by SSCDL / SMC.

4. SI will implement the Biometric attendance system for the attendance of Project team proposed in this document. The SI will share the attendance report with the SSCDL at the end of the month. The quarterly payment will be disbursed as per the SLA clauses mentioned in Vol 1, Section 8.

6.   Implementation and Roll out Plan

The ITCS project requires vast experience, expertise and technical & financial capability by a System Integrator for implementation of the project and to manage proper operation and maintenance. Apart from the technical strength, financial capability plays a major role and needs due diligence for smooth project implementation.

The project has been envisaged to be implemented in three phases as specified in the request orders in volume 1.

The following table gives the details of the phases, timelines and deliverables that the SI shall adhere:

#	Time line (in months)	ITCS	Capacity Building/ Training	IT Infrastructure Implementation	Deliverables
	T	15 days from date of LoI issuance			Performance Bank Guarantee , Signing of Contract
1	T+0.5	Project Kick Off – This scope element requires the SI to undertake the following as part of kick off and mobilization. 1. Confirm scope of project and prepare the engagement brief 2. Prepare a Strategy and Assess Stage plan 3. Select required Programme management procedures, standards, methods, tools 4. Preparation of quality Plan			1. Project charter 2. Project Implementation Plan 3. Work Breakdown Structure 4. Quality Management plan

		5. All final deliverables will be finalized in consultation with the client and agreed including project implementation plan and deployment schedule of resources		5. Risk Management and Mitigation Plan 6. Migration plan 7. Resource Deployment Plan 8. Stakeholder management plan 9. Communication plan 10. Change management plan 11. Escalation management plan 12. Exit management plan
Scoping and Feasibility study Phase				
2	T+1	The SI shall be responsible for: • Assessment of the existing traffic signaling systems and software applications • Feasibility study for finalization of detailed technical architecture and project plan • SI to carry out Site Survey for each junction for junction Design (Civil Works) and build drawings of all Junctions • Analyze the current traffic conditions and establish base line values for traffic management parameters like junction behavior, average stoppage time, average speed per lane, average travel time etc.	• Basic Computer Skills training for officers of the rank of TI and below Orientation to ITCS and its Benefits to officers of SMC, SSCDL and police	1. Feasibility Report including the drawings of all junctions with finalized BoQ, submitted to general consultant for validation and sharing with the Transport SME, SSCDL and Traffic

		• Development of traffic management plans for individual signal controls and groups of signal controllers along with pre-planned intervention strategies for special scenarios • Studying the design architecture, carrying out site survey and finalize the distribution, exact position of the various systems and its components • Identify the buildings, structures, fences, trees, existing installation, that are to be removed/ relocated for installation of the various systems and its components • Identifying the variation to be made to the existing list of locations if any. • Identification of existing infrastructure that can be utilized if any. • Placing survey markers at all locations of installations, showing them on the engineering drawings, checking accuracy of their position, coordinating them with SSCDL, Traffic Police or any third party agency designated by the SSCDL		Police department for approval 2. Roll out plan for each system including existing and proposed new systems and its components, which will include implementation phases, migration plan, and acceptance testing plan. 3. Final List of equipment including current infrastructure reusability report for mounting infrastructures like poles, cantilevers, cabling etc. 4. Engineering drawing submittals 5. Detailed integration requirements

6. Functional, System Requirement Specification Report and Software Requirement Specification reports meeting all the Business, Functional and technical requirement of SSCDL and incorporating all the functional specifications, standards provided by the SSCDL and different integration points with external agencies and other applications.

- Application customization report
- System design documentation describing the logical security

					architecture design, Physical security architecture design • Migration plan for switching network connectivity operations on City Network Backbone
4	T+2	• Approval of Site survey report, implementation strategy, migration plan, Reusability and project Plan • Completion of permissions from other agencies • Design for integration with other external applications • Initiation of helpdesk setup	• Change Management & Capacity Building Plan • Change Readiness Assessment • Orientation to ITCS and its benefits to officers of the rank of TI and below • Change Mgmt & Communication Workshop for TI and below • Project Management trainings for DCP and above	• Infrastructure Sizing Report & Deployment Plan • Validation of IT Infrastructure requirements* • Final Bill of Material (BoM) with Technical specifications for the ITCS field equipment like camera, sensors etc., IT Hardware, Network and other IT Infrastructure Requirements • Strategy for all Traffic Centre's Hardware	• Report on Approach for Capacity Building &Tools/ Formats for evaluation of capacity building measures • Capacity Building Plan • Change Management Strategy • Detailed plan for change management • Communication plan • Documentation on approved & procured IT Infrastructure and proposed control centre sites To-Be Process Document

				procurement & Deployment plan	(Final Solution Blueprint)
				• Procurement of IT infrastructure & field devices (PO issued by SI) • Site preparation for pilot locations	• Final BoM • Change Management workshops completion Report • Knowledge Transfer Plans • Report on strategy for helpdesk setup & operations

Deployment Phase: Reference for Request Order 1 (Similar Schedule will be applicable for Request Order 2 and Request Order 3)

5	T + 3	• Upgradation and deployment of new infrastructure for existing traffic signaling systems at traffic junctions already covered under BRTS Request order 1 and Request Order 2 extension project • Deployment of new field devices for ITCS • Procurement and supply of requisite licenses	• Preparation of training Curriculum and training materials • Role based training on ITCS application for pilot locations • Training on ITCS core Modules functioning and back office operations • Traffic Command Centre & Network Administration training	• Network Communication Backbone establishment • Site preparation for TCC • Infrastructure setup for Phase I locations • IT Infrastructure Installation at DC, and TCC	• IT Infrastructure Installation Report with user manuals • Field devices installation Report with user manuals • Application Test Plan and Test Cases • Report on amendments / enhancements / modifications made in ITCS applications

		(Commercial off the shelf - COTS), Installation and implementation (including configuration/ customization and Testing)Completion of ITCS application customization		based on inputs from Surat Police, SSCDL • Phase I Acceptance from SSCDL and Surat Police • Overview Training Completion report • Training material
Testing: Reference for Request Order 1 (Similar Schedule will be applicable for Request Order 2 and Request Order 3)				
6	T+ 3.5	• Application testing including unit testing, system integration testing, user acceptance testing, performance testing (Full Load, Stress test) and Security and access control testing etc. • Site specific system testing		• Partial Acceptance Testing (PAT) of the IT Infrastructure and Network Connectivity performance of TCC site. • Preparation of IT Infrastructure System manual	• PAT report and Factory Testing Report • PAT Report on IT Infrastructure (TCC and all locations) • Network connectivity Test Report • IT Infrastructure System Operation Manual • IT Infrastructure Maintenance and Troubleshooting Manual

Smart City

					• Site specific test plans and test scripts for each installation site in the region • Overall test report
Go-Live: Reference for Request Order 1 (Similar Schedule will be applicable for Request Order 2 and Request Order 3)					

7	T+ 4	• Phase I- Go-live
		• Commencement of Handholding for Pilot locations
		• Help desk Setup Go-Live
			• Role based training on ITCS application for pilot locations
			• Training on ITCS core modules/TCC functioning and back office operations for phase I locations
			• Management Information System/Reporting training to DCP and above
			• Regional Traffic Management Control Centre & Network Administration training
			• Teamwork and Communication skills training
				• Implementation of ITCS System at pilot locations and other System Software including Help Desk	• Report on module specific role based training on ITCS (trainees attended, pass/fail status etc.)
					• IT Infrastructure Installation Report for phase I locations
					• Phase I Go-Live Report including
					  o Site Preparation and Infrastructure Deployment / Commissioning Report for Data Centre
					  o Help desk centre operations

				o Issues faced during installation along with their remedies
Stabilization Phase: Reference for Request Order 1 (Similar Schedule will be applicable for Request Order 2 and Request Order 3)				
8	T+5	• ITCS stabilization post Request Order I • Completion of Changes required post Request Order I Go-Live • Third Party Audit for Request Order I locations.	• Continuation of End user training for users selected in Request Order I	• Request Order I learning and customization completion report • Report on amendments / enhancements / modifications made based on inputs of SSCDL, Surat Police / Third Party's Acceptance Testing for complete Roll-Out • Go-Live Acceptance from SSCDL, Surat Police • Deployment report for Handholding support to phase I Location

					• Finalize integration strategy for TCC,

Activities for Overall Go-Live (During the Request Order 3 Phase)

| 11 | T+10 | • Deployment of field devices for ITCS
• Completion of ITCS application customization
• ITCS integration plan
• ITCS application testing plan | • Change management Training
• Preparation of training Curriculum and training materials
• Role based training on ITCS application for all locations
• Training on ITCS core modules/TCC functioning and back office operations for remaining locations
• TCC & Network Administration training
• Preparation of end user manual | • Network Communication Backbone establishment
• IT Infrastructure Installation at TCC, DC
• Infrastructure setup for Phase II locations | • IT Infrastructure (TCC, and DC Installation Report
• Overview of Training Completion report
• Training plan and schedule
• Training material
• Application Test Plan and Test Cases
• Report on amendments / enhancements / modifications made based on inputs of SSCDL, Surat Police
• Deployment phase acceptance from SSCDL, Surat Police
• Integration test plan
• Report on module specific role based training on ITCS |

					(trainees attended, pass/fail status etc.)
13	T+10.5	• Application testing including unit testing, system integration testing, user acceptance testing, performance testing (Full Load, Stress test) and Security and access control testing etc.		• Partial Acceptance Testing of the IT Infrastructure and Network Connectivity performance of TCC and DC. • Preparation of IT Infrastructure System manual	• PAT report, User Acceptance and Factory Testing Report FAT Report on IT Infrastructure (TCC and all locations) • Network connectivity Test Report

		• Site specific system testing			• Site specific test plans and test scripts for each installation site in the region • IT Infrastructure System Operation Manual • IT Infrastructure Maintenance and Troubleshooting Manual
14	T+11	• Go-live • Commencement of Handholding for all locations • Completion of ITCS integration with external agencies	• Continuation of role based end user training	• Implementation of ITCS System at all location and other System Software including Help Desk	• IT Infrastructure Installation Report for all locations • Go-Live Report • Go-Live Acceptance from SSCDL, Surat Police • End User Training Completion Report
Stabilization Phase: Overall Go-Live					
15	T+12	• ITCS stabilization post Go-Live • Third Party Audit for project • Completion of Post implementation analysis			• Third party audit report • Analysis report giving comparisons with Base line traffic parameters

				as established during study phase

16		• Continuation of handholding programme	• Completion of Training to IT Core Team
			 • IT Infrastructure Security Training
			 • Data Centre & Network Administration Training Hardware component Monitoring and maintenance Training Completion of end user training for all phases
				1. Training Completion reports on:
				   o IT Infrastructure
				   o DC, Network Administration
				   o Hardware component installation and administration
				
				 2. Following Final Reports on
				
				   o Approved Access Control and Authorization Policy for Surat Police, SSCDL
				   o Final Report on the Access rights and control structure
				   o Final report on ITCS

				Configuration/ customization for all modules o End User Manual for ITCS field installations, system installations o End user training completion report o ITCS integration completion report o End user manual report o Completion of handholding report o People deployed in Command Control centers and Helpdesk
Post Implementation Phase- Operations and Maintenance Phase				
17	5 Years from date of final go live		• SLA and Performance Monitoring Plan • Migration of network bandwidth services on to the city network backbone of "Surat Backbone" project • Project Operate and Review Logging, tracking and resolution of issues. • Training curriculum updates corresponding to updates/modifications to ITCS modules	• Migration Report for Network backbone • Detailed plan for monitoring of SLAs and performance of the overall system

		- Fortnightly Progress Report on Project including SLA Monitoring Report and Exception Report - Details on all the issues logged - Quarterly reports on the Base Line parameters/ KPIs established improvements thereafter - Annual analysis report giving comparisons with Base line traffic parameters/ KPIs as established during study phase - Training to end users on any system upgrade

7.   Annexure I: List of Locations

7.1. List of Existing Traffic Signals

#	Junction Name	Number of Arms	Signal System Type
1.	Kinnary Junction	3	Fixed Time
2.	Udhana Darwaja	4	Fixed Time
3.	Kadiwala Junction	4	Fixed Time
4.	Majuragate Junction	4	Fixed Time
5.	RTO Junction	3	Fixed Time
6.	Circuit House	3	Fixed Time
7.	Athwagate	3	Fixed Time
8.	Choksiwadi	3	Fixed Time
9.	Primearcade 1	3	Fixed Time
10.	Primearcade 2	3	Fixed Time
11.	Honeypark	4	Fixed Time
12.	Palanpur Jakatnaka	4	Fixed Time
13.	Sahara Darwaja	3	Fixed Time
14.	Delhigate	4	Fixed Time
15.	Amisha Hotel	3	Fixed Time
16.	Suryapur Gate	2	Fixed Time

#	Junction Name	Number of Arms	Signal System Type
17.	Lambe Hanuman	3	Fixed Time
18.	Naginawadi	4	Fixed Time
19.	Singanpore	4	Fixed Time
20.	Hodi Bunglow	4	Fixed Time
21.	Chowk Bazar	4	Fixed Time
22.	Bhagal	4	Fixed Time
23.	Navsari Bazar	4	Fixed Time
24.	Timaliyawad	4	Fixed Time
25.	Raghukul Market	3	Fixed Time
26.	Union Park	4	Fixed Time
27.	Ramchowk	3	Fixed Time
28.	LB 1	3	Fixed Time
29.	LB 2	3	Fixed Time
30.	Satya nagar Bus Stand (South Zone Office)	3	Vehicle Actuated
31.	Udhna Teen Rasta Bus Stand	3	Vehicle Actuated
32.	Gurudwar Udhana Bus Stand	2	Vehicle Actuated
33.	Udhna Academy College	2	Vehicle Actuated
34.	Laxmi Narayan Mandir Teen Rasta	3	Vehicle Actuated

#	Junction Name	Number of Arms	Signal System Type
35.	Laxmi Narayan Mandir Bus Stand	2	Vehicle Actuated
36.	Daksheshwar Mahadav Mandir (Bus Stand)	3	Vehicle Actuated
37.	Zota House Pandashra GIDC (Bus Stand)	4	Vehicle Actuated
38.	Naveen Flourin	2	Vehicle Actuated
39.	Bhestan Nahar	4	Vehicle Actuated
40.	Bhagawati Nagar GIDC (Bus Stand)	2	Vehicle Actuated
41.	Bhestan Crossing	4	Vehicle Actuated
42.	Bhestan Stn. Road	3	Vehicle Actuated
43.	Unn Naka Bus Stand	4	Vehicle Actuated
44.	Unn Crossing Bus Stand	4	Vehicle Actuated
45.	Green Park Bus Stand	3	Vehicle Actuated
46.	Sachin GIDC Bus Stand	3	Vehicle Actuated
47.	Dumas Resort 'Y' junction	2	Vehicle Actuated
48.	Maharanapratap junction	4	Vehicle Actuated
49.	VIP road junction	4	Vehicle Actuated
50.	S. D. Jain school junction	4	Vehicle Actuated
51.	J. H. Ambani junction	4	Vehicle Actuated
52.	Someshwara junction	4	Vehicle Actuated

#	Junction Name	Number of Arms	Signal System Type
53.	VNSGU Gate junction	2	Vehicle Actuated
54.	Sport sankul junction	3	Vehicle Actuated
55.	centre for social study	2	Vehicle Actuated
56.	Anuvrat Dwar(Ashirwad park junction)	4	Vehicle Actuated
57.	Panas gam junction	3	Vehicle Actuated
58.	Bread linear road Junction	3	Vehicle Actuated
59.	Ishwar Farm junction	3	Vehicle Actuated
60.	Vivekanand garden	4	Vehicle Actuated
61.	Jamanagar junction	4	Vehicle Actuated
62.	Rupali Naher junction	4	Vehicle Actuated
63.	Kapadia Health Club junction	4	Vehicle Actuated
64.	Unique Hospital junction	4	Vehicle Actuated
65.	Bhathena junction	4	Vehicle Actuated
66.	Raghukul Market	3	Vehicle Actuated
67.	Model town Junction	4	Vehicle Actuated
68.	Puna gam junction	4	Vehicle Actuated
69.	Royal park junction	4	Vehicle Actuated
70.	Vanmali junction	3	Vehicle Actuated

#	Junction Name	Number of Arms	Signal System Type
71.	simada naher junction	3	Vehicle Actuated
72.	Simada Gam junction	3	Vehicle Actuated
73.	Yoginagar Chowk junction	4	Vehicle Actuated
74.	Shyamdham society junction	4	Vehicle Actuated
75.	swaminarayan mandir junction	2	Vehicle Actuated
76.	Dindoli Chaar Rasta near Dindoli Police Station	4	Vehicle Actuated
77.	Karni Mata Chowk / New Bombay Market	3	Vehicle Actuated
78.	Sardar Market	2	Vehicle Actuated
79.	Parvat patiya junction	5	Vehicle Actuated
80.	Puna Patiya	4	Vehicle Actuated
81.	Landmark Empire Market	2	Vehicle Actuated
82.	Poddar Arcade, Varachha	3	Vehicle Actuated
83.	Ware House, Varachha	3	Vehicle Actuated
84.	Mini Bazar	3	Vehicle Actuated
85.	Hirabaug junction	5	Vehicle Actuated
86.	Kapodara Char Rasta	4	Vehicle Actuated
87.	Kapodara Police Station	3	Vehicle Actuated
88.	VIP Chowk / Circle	4	Vehicle Actuated

#	Junction Name	Number of Arms	Signal System Type
89.	Maharana Pratap Chowk	4	Vehicle Actuated
90.	Near Khodiyar Mata Temple T Point, Nana Varachha	3	Vehicle Actuated
91.	Bus Stand 1	2	Vehicle Actuated
92.	Bus Stand 2	2	Vehicle Actuated
93.	Bus Stand 3	2	Vehicle Actuated
94.	Bus Stand 4	2	Vehicle Actuated
95.	Bus Stand 5	2	Vehicle Actuated
96.	Bus Stand 6	2	Vehicle Actuated
97.	Bus Stand 7	2	Vehicle Actuated
98.	Bus Stand 8	2	Vehicle Actuated
99.	Bus Stand 9	2	Vehicle Actuated
100.	Bus Stand 10	2	Vehicle Actuated
101.	Bus Stand 11	2	Vehicle Actuated
102.	Bus Stand 12	2	Vehicle Actuated
103.	Bus Stand 13	2	Vehicle Actuated
104.	Aaspas Mandir	4	Vehicle Actuated
105.	Khodiyar nagar /Jogani maa Chowk	3	Vehicle Actuated
106.	Midas Square	4	Vehicle Actuated

#	Junction Name	Number of Arms	Signal System Type
107.	Capital Square	3	Vehicle Actuated
108.	Shakti nagar (Sanskruti AC Market)	3	Vehicle Actuated
109.	Royal square	4	Vehicle Actuated
110.	Intercity Township Mid Block	2	Vehicle Actuated
111.	Aaimata Chowk	4	Vehicle Actuated
112.	Bharat Cancer Hospital	3	Vehicle Actuated
113.	Saroli Jakatnaka	3	Vehicle Actuated
114.	Puna Kumbhariya	3	Vehicle Actuated
115.	Vaishali Junction	4	Vehicle Actuated
116.	Sarthana Water works (Chikuwadi)	3	Vehicle Actuated
117.	Sarthana Zoo Junction	4	Vehicle Actuated
118.	Navjivan Restaurant (Recommended)	3	Vehicle Actuated
119.	Dharamnagar Chowk (Shyamdham Mandir Junction)	4	Vehicle Actuated
120.	Valak Junction	2	Vehicle Actuated
121.	Laskana Patiya Char rasta	4	Vehicle Actuated
122.	Laskana char rasta	2	Vehicle Actuated
123.	Pasodara Char rasta	2	Vehicle Actuated

7.2. List of Existing City Surveillance System

#	Location Name	Number of Cameras	Functionality Type
1.	Chowk	9	Surveillance
2.	Bhagal char rasta	11	Surveillance
3.	Mahidhar pura	4	Surveillance
4.	Delhi gate	3	Surveillance
5.	Central bus stop	6	Surveillance
6.	City bus stop	3	Surveillance
7.	Surat railway station	23	Surveillance
8.	Mata wadi	3	Surveillance
9.	Mini bazar	6	Surveillance
10.	Sarthana chek post	3	Surveillance
11.	Niyol Chekpost	3	Surveillance
12.	Salasar gate	4	Surveillance
13.	Textile Mkt Police chowky	3	Surveillance
14.	Camela	4	Surveillance
15.	Kinnery	2	Surveillance
16.	Hazira coastal	4	Surveillance
17.	Ongc	5	Surveillance
18.	Saroli oplpad chekpost	3	Surveillance
19.	Bahumali Building	4	Surveillance
20.	New court	1	Surveillance

#	Location Name	Number of Cameras	Functionality Type
21.	Rangila park	5	Surveillance
22.	Chowpati	2	Surveillance
23.	Kaphletha	2	Surveillance
24.	Joggers Park	3	Surveillance
25.	Turning Point	9	Surveillance
26.	Majura Gate	17	Surveillance
27.	Civil Char Rasta	5	Surveillance
28.	Udhana darwaja	13	Surveillance
29.	Sahara darwaza	8	Surveillance
30.	Central Bus Depot(RLY staion)	3	Surveillance
31.	Ayurvedik Hospital	4	Surveillance
32.	Bhavani Mata Mandir	4	Surveillance
33.	DKM Circle	5	Surveillance
34.	Parle Point	6	Surveillance
35.	Kargil Circle	7	Surveillance
36.	Rahul Raj Mall	2	Surveillance
37.	LP Savani Circle	9	Surveillance
38.	Adajan Patia Dhanmora	9	Surveillance
39.	Swami Vivekanand River Bridge	4	Surveillance
40.	Vivekanand Circle	8	Surveillance

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#	Location Name	Number of Cameras	Functionality Type
41.	Athwa Gate	17	Surveillance
42.	Varacha Khand Bazar Underpass	2	Surveillance
43.	Varacha Poddar Plaza Fly over	2	Surveillance
44.	Lambehanuman Underpass	2	Surveillance
45.	Sahara Darvaja Underpass	2	Surveillance
46.	RTO Circle	12	Surveillance
47.	Saiyadpura Pumping stn	5	Surveillance
48.	Hodi Bunglow	5	Surveillance
49.	Pandol Ved katargam Road	7	Surveillance
50.	Singanpur Char Rasta	5	Surveillance
51.	Amroli River Bridge	3	Surveillance
52.	Amroli Char Rasta	2	Surveillance
53.	Gajera Circle	10	Surveillance
54.	nagina wadi	9	Surveillance
55.	Hira Baug Circle	7	Surveillance
56.	Kapodara Char rasta	4	Surveillance
57.	Baroda prestige	7	Surveillance
58.	ekta circle	8	Surveillance
59.	Sayan Check Post	3	Surveillance
60.	Simada Check Post	4	Surveillance
61.	PCR van	4	Surveillance

#	Location Name	Number of Cameras	Functionality Type
62.	Udhna Darwaja Fly Over	2	Surveillance
63.	Godadara	10	Surveillance
64.	Limbayat Undarpass	2	Surveillance
65.	Parle Point Fly Over	2	Surveillance
66.	Science centre	3	Surveillance
67.	Ashok Pan	8	Surveillance
68.	Sosyo Circle	5	Surveillance
69.	Sosyo Circle Fly Over	2	Surveillance
70.	Aai Mata Circle	8	Surveillance
71.	Ashwanikumar Underpass	2	Surveillance
72.	Udhana Aaymata Fly Over(parvat patiya)	1	Surveillance
73.	Evershine Marbel	3	Surveillance
74.	Bhatar Char Rasta	7	Surveillance
75.	Nilgiri Circle	9	Surveillance
76.	Navsari Bazar	7	Surveillance
77.	Majuragate Fly Over	2	Surveillance
78.	Sangam Chara rasta	6	Surveillance
79.	Nana Varacha Fly Over	2	Surveillance
80.	Yogi Chowk	8	Surveillance
81.	Gujarat Gas Circle Adajan	6	Surveillance
82.	Kapodra Fly Over	6	Surveillance

#	Location Name	Number of Cameras	Functionality Type
83.	Udhna Kharvar nagar Fly Over	3	Surveillance
84.	Dindoli Railway Bridge	4	Surveillance
85.	Udhna Bus Stop IN OUT	3	Surveillance
86.	Lal Gate	4	Surveillance
87.	Bhesthan Char rasta	6	Surveillance
88.	Kishor Coldrinks, Cinema road	5	Surveillance
89.	Civil Char Rasta Fly Over	2	Surveillance
90.	Mitthi Khadi Water Tank	6	Surveillance
91.	Raghukul Mkt	2	Surveillance
92.	Bhatena New fly Over	2	Surveillance
93.	Ragukul Market Underpass	2	Surveillance
94.	Ring road Fly Over	1	Surveillance
95.	Vadinath Chowk	1	Surveillance
96.	Bapu Nagar	2	Surveillance
97.	Navagam Underpass	1	Surveillance
98.	savji korat Bridge	2	Surveillance
99.	saroli after bridge	1	Surveillance
100.	Bhimrad chekpost	2	Surveillance
101.	causway	2	Surveillance
102.	udhana zero number	3	Surveillance

#	Location Name	Number of Cameras	Functionality Type
103.	udhana teen rasta	5	Surveillance
104.	Sardar Bridge	2	Surveillance
105.	Dabholi Bridge	2	Surveillance
106.	Sachin Vanz Char Rasta	6	Surveillance
107.	Bhatiya Chek post	5	Surveillance
108.	Abhrama chekpost	2	Surveillance
109.	Gauvrav Path	2	Surveillance
110.	visitor entry	1	Surveillance
111.	Piyush Point	8	Surveillance
112.	ANPR chowpaty	4	ANPR
113.	Saroli After Bridge	4	ANPR
114.	Sarthana Check Post	4	ANPR
115.	Simada Naher Check Post	4	ANPR
116.	Niyol Check Post	4	ANPR
117.	Sahara Darwaja	4	ANPR
118.	Sayan Check Post	2	ANPR
119.	Kapodra Char Rasta	4	ANPR
120.	Bheem Rad Check Post	2	ANPR
121.	Bhatiya Check Post	4	ANPR
122.	Sachin Vanz Char Rasta	4	ANPR
123.	Abrama Check post	4	ANPR

#	Location Name	Number of Cameras	Functionality Type
124.	Amroli Cross Roads	4	ANPR
125.	Singanpor Char Rasta	4	ANPR
126.	ONGC Cross Roads	4	ANPR
127.	Majuragate Fly over	4	ANPR
128.	Surat rly Staion	5	Face Recognition
129.	Central Bus Stop	2	Face Recognition
130.	Gauvrav Path	2	Speed Detection
131.	VIP Road	2	Speed Detection
132.	L P Savani Road Adajan	2	Speed Detection
133.	Varachha fly over	2	Speed Detection
134.	Vesu	2	Speed Detection

7.3. List of locations for proposed (New) ATCS Systems

#	Junction Name	Number of Arms
1	Kinnary Junction	3
2	Udhana Darwaja	4
3	Kadiwala Junction	4
4	Majuragate Junction	4

#	Junction Name	Number of Arms
5	RTO Junction	3
6	Circuit House	3
7	Athwagate	3
8	Choksiwadi	3
9	Primearcade 1	3
10	Primearcade 2	3
11	Honeypark	4
12	Palanpur Jakatnaka	4
13	Sahara Darwaja	3
14	Delhigate	4
15	Amisha Hotel	3
16	Suryapur Gate	2
17	Lambe Hanuman	3
18	Naginawadi	4
19	Singanpore	4
20	Hodi Bunglow	4
21	Chowk Bazar	4
22	Bhagal	4
23	Navsari Bazar	4
24	Timaliyawad	4
25	Raghukul Market	3
26	Union Park	4
27	Ramchowk	3
28	LB 1	3
29	LB 2	3
30	Hirabaug kapodra junction	5
31	Dhabkar Circle	4

#	Junction Name	Number of Arms
32	Tadwadi junction	3
33	Suryapur society junction	4
34	V.M Sakriya circle	3
35	Swaminarayan Circle	3
36	Palanpur patiya	3
37	Nitaben Satbhaya circle	4
38	Ramnagar	4
39	Morabhagal	5
40	Gujarat Gas circle	4
41	Adajan Patiya	4
42	Bhulka bhavan school junction	3
43	Adajan gam junction	4
44	Pal New R.T.O	3
45	Star bazar junction	3
46	Pal jakatnaka Junction	3
47	ONGC Circle	4
48	Magdalla Gam Junction	3
49	Y- junction Udhana Magdalla road	3
50	Shree sai mandir junction (valentine)	3
51	Kargill chowk Junction	3

#	Junction Name	Number of Arms
52	S.V.N.I.T Junction	3
53	OM Terace junction	3
54	St.thoms school junction	3
55	Kailash Nagar Junction	4
56	Althan canal junction	4
57	Rahul raj mall	3
58	Anurat Dwar, U.M. Road	4
59	Sri Niketan Society / Bhartana School Junction	3
60	Patrakar Colony Junction	3
61	Piyush Junction	4
62	Rachana Society Junction	4
63	Tulsi Dham	3
64	Sita nagar chokdi	4
65	Vishwakarma junction	4
66	Magob	4
67	Gajera circle	4
68	Fulpada Road Junction	3
69	Ashwanikumar road junction	4
70	Kailash dham junction	4
71	Amroli char rasta	4
72	Kosad fire station	3

#	Junction Name	Number of Arms
73	Cross road junction	3
74	Saraswati school junction	4
75	Vallabhachary Road Junction	3
76	Maan sarovar circle	3
77	Jahngirpura bridge	4
78	Dabholi char rasta	4
79	Lalita chokdi	4
80	Rashi circle	4
81	Gajera school junction	4
82	Katargam Darwaja	3
83	Katargam north zone office / Laxmi Enclave Circle	3
84	Mehta petrol pump junction	3
85	Dabholi gam junction	4
86	Moti ved	4
87	Katargam Bridge	3
88	Laxmikant ashram junction	3
89	Kosad E.W.S Junction	4
90	Samrat Vidhyalay*	5

#	Junction Name	Number of Arms
91	Kharwar Nagar junction / Rokadya Hanuman	5
92	Kabir House	5
93	Dabholi Y Junction	3
94	Santoshnagar L H Road	4
95	Adarshnagar Junction	3
96	Textile Chhatri Point	3
97	Classic T Point	3
98	Makkaipul	5
99	Sosyo Circle Point	4
100	Mangadh Chowk	4
101	J B Diamond Circle (Lambe Hanuman)	3
102	Hidayat Nagar Chowki Circle	4
103	Ruwala Tekda	4
104	Galemandi Char Rasta	3
105	Singanpore Casway Circle	4
106	Ajramar Char Rasta	4
107	Near Airport Main Gate	3
108	Kuwada Tin Rasta	3
109	Bhatar Char Rasta	4

#	Junction Name	Number of Arms
110	Loudge's Convent T Point	3
111	Pizza hut T Point, Ghoddod Road	4
112	Citi Bank Char Rasta, Ghoddod Road	4
113	Navjivan Circle, Udhana Magdalla Road	3
114	Ashapuri Tin Rasta	3
115	Saint Xevier's Highschool Circle	3
116	Maruti Nagar Char Rasta (Veer Bhagat Singh Chowk)	4
117	Godadara Chowki Char Rasta	4
118	Kamela Darwaja	4
119	Daruwala Petrol Pump, Station Road	3
120	Time Jakatnaka, Surat Railway Station	2
121	Rampura Tin Rasta	4
122	Sumul Dairy Road, Under Alkapuri Bridge	4
123	Labheshwar Bhuvan	3

#	Junction Name	Number of Arms
124	Purushottam Ginning Mill, Varachha / Mamta Park Circle	4
125	Devji nagar T Point	3
126	Bhavani Gems	4
127	Umiya Circle	5
128	Archana School Circle	3
129	Sheetal Char Rasta	4
130	Vijay Vallabh Chowk	5
131	Gandhiji Statue near State Bank HQ	4
132	Hijdawad Char Rasta	5
133	Sabjail Tin Rasta Point / Chamunda Resturant	4
134	Havadiya Chakla	4
135	Falsawadi Circle / Golden Point Circle	3
136	Zampa Bazar Saliya Market	4
137	Gaviyar Gam Bus Stand	3
138	Ashok Pan Centre, City Light Road	3
139	Magdalla Bandar T Point	3

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#	Junction Name	Number of Arms
140	Pal Canal Jalaram Temple	4
141	Bhatha gam T Point	3
142	Akhand anand College Circle	3
143	Amba Talavadi Char Rasta	4
144	Near Ved Road Police Chowki Tin Rasta	3
145	Nilgiri Circle	4
146	Moti Talkies	4
147	Khaskiwad, Bhagal Road	4
148	Godhani Circle / Katargam Badashram	5
149	Bombay Market	3
150	Police HQ	3
151	Ashirwad Canal T Point	3
152	Jani Farshan	3
153	Sargam Shopping Center	4
154	S K Nagar	4
155	Lal Darwaja	4
156	Minaxi Circle	4
157	Ankur Vidyalaya Tin Rasta	3
158	L P Savani Char Rasta	4
159	D K M Circle	4
160	Sayyed Pura	4

#	Junction Name	Number of Arms
161	Tuli Hospital T Point, Ghoddod Road	3
162	ONGC Char Rasta	4
163	Old Lalgate T Point	5
164	Rukshmanibai Hospital	4
165	People's Bank Char Rasta	4
166	Parle Point Junction	4
167	Magdalla Government Quarters T Point	3
168	Ambanagar Canal	3
169	Gaushala A K Road	4
170	Matawadi Char Rasta	4
171	Valinath Chowk	4
172	Near Amroli Jakatnaka Bridge	3
173	Yogi Chowk	4

7.4. List of Proposed locations for RLVD System

#	Junction Name	No of Arms
1	Athwagate Circle	4
2	RTO, Ring Road	3
3	Union Park Char Rasta	4
4	Majura Gate Junction	4
5	Kadiwala, Ring Road	4
6	Udhana Darwaja	4
7	Sahara Darwaja	4

#	Junction Name	No of Arms
8	Gajera circle	4
9	Chowk Bazar Char Rasta	4
10	Bhagal	4
11	Patrakar Colony Junction	3
12	South Zone Office	3
13	Udhna Teen Rasta Bus Stand	3
14	Unn Teen Rasta	3
15	Amroli char rasta	4
16	Purushottam Ginning Mill	4
17	Karni Mata Chowk / New Bombay Market	3
18	Puna Patiya	4
19	Hirabaug junction	4
20	Yoginagar Chowk junction	4
21	Palanpur Jakatnaka	4
22	Prime Market, Adajan	3
23	Honey Park	4
24	Ramnagar	4
25	Rushab char Rasta	4

7.5. List of Proposed locations for Speed Violation Detection System

#	Junction Name
1	Udhana Magdalla road - Jolly Party Plot
2	VIP Road - E-Space Building
3	S K Nagar - Dumas Langar
4	Khajod char rasta - Althan junction
5	SVR Circle - Kargil Chowk
6	Amba Talwadi - Ved road (Neru Farm Road

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#	Junction Name
7	South Zone Office - Unn Patiya
8	Ved Road Singanpore -Dhaboli char rasya
9	Simada char rasta - Navjivan Hotel
10	Parvart Patiya - Simada Check post
11	Simada Naka - D Mart Mall (From Sarthana Jakatnaka to overbridge)
12	Vaishali Teen Rasta - Simada (overbridge)
13	Pal RTO - Ichapur Haveli
14	Mora Bhagal - Jahangir char rasta
15	Dandi Road

7.6. List of Proposed locations for Traffic Violation Cameras System

#	Junction Name	No of Arms
1	Athwagate Circle	4
2	Udhana Darwaja	4
3	Kadiwala, Ring Road	4
4	Rokdiya Hanuman Char rasta	4
5	Kargil Chowk	3
6	Railway Station Yard	3
7	Rushab Petrol Pump Ringroad	3
8	Falsawadi Circle	3
9	Bapa Sitaram Chowk	4
10	Paras Chowkdi char rasta	4
11	Kamela Darwaja	4
12	Dhanmora Complex	4
13	Singanpore Char Rasta	4
14	South Zone Office	3
15	Dakeshwar char rasta	4
16	Unn Char Rasta	4
17	Udhana Gham	3

#	Junction Name	No of Arms
18	Bhathena Nehar	3
19	Bharat Nagar	3
20	Kapodara Char Rasta	4
21	Mini Bazar	3
22	Hirabaug junction	4
23	Rachna Circle	3
24	CNG Pump	3
25	Nana Varchagham	4
26	New Bombay Market	3
27	Parvat patiya junction	5
28	Puna Patiya	4
29	Bhulka bhavan school junction	3
30	Navyug College	3
31	Subhash Nagar Garden	3

7.7. List of proposed locations for Traffic Surveillance Cameras System

#	Junction Name	No of Arms
1	Daksheshwar mahadev mandir junction	3
2	Unn Naka Bus Stand	4

#	Junction Name	No of Arms
3	Dumas Resort 'Y' junction	3
4	VNSGU Gate junction	2
5	Unique Hospital junction	4
6	Swaminarayan mandir junction	4
7	Keshav Nagar Police Chowki /Model town junction	4
8	Ramchowk, Ghoddod Road	3
9	Palanpur Jakatnaka	4
10	Palanpur patiya	3
11	Prime Market, Adajan	3
12	PragatiWadi / Honey Park, Adajan	4
13	Hirabaug kapodra junction	5
14	Tadwadi junction	3
15	Star bazar junction	3
16	Y- junction Udhana Magdalla road	3
17	Anurat Dwar, U.M. Road	4
18	Patrakar Colony Junction	3
19	Sita nagar chokdi	4
20	Dabholi char rasta	4
21	Gajera school junction	4
22	Kosad E.W.S Junction	4
23	Sumul Dairy Road, Under Alkapuri Bridge	4
24	Gandhiji Statue near State Bank HQ	3
25	Sabjail Tin Rasta Point / Chamunda Resturant	4

#	Junction Name	No of Arms
26	Falsawadi Circle / Golden Point Circle	3
27	Zampa Bazar SaliyaMarket	4
28	Bombay Market	3
29	Sargam Shopping Center	4
30	Lal Darwaja	4
31	Parvat patiya junction	5
32	Navjivan Restaurant (Recommended)	3
33	Ambedkar Statue Nr World Trade Center	4
34	Pran Nath Hospital	3
35	SingapuriWadi	4
36	Yarn Bazar	4
37	Kamal Gali	3
38	Madina Masjid Chowk	4
39	Soham Cicle	5
40	Kaddar Sanni Naad	4
41	Kamrej Char Rashta	4
42	Classic T Point	3

#	Junction Name	No of Arms
43	Chauta Bazar	2
44	Udhna Railway Station	3
45	Kapodra Chowpati	2
46	Sudama chowk, Amroli	4
47	Lajamani chowk, Amroli	3
48	Chaparbhata (Amroli)	4
49	Panas gaam entry gate Agri. University jn	3
50	Althan Char Rasta/Bredliner Circle	4

7.8. List of proposed locations for ANPR System

#	Junction Name	No of Arms
1	Surat Railway Station	2
2	Sardar Bridge	6
3	Limbayat Mitthi Khadi	2
4	Adajan Circle	6
5	Hodi Bunglow Khadi Pool	3
6	Anuvrat Dwar-Canel Jn.	3
7	Sachin GIDC Char Rasta	4
8	Makkai Bridge	6
9	Bhagal Char Rasta	4
10	Katargam Char Rasta	3
11	Dabholi Char Rasta	4
12	Causway	1
13	Dabholi Bridge	1

#	Junction Name	No of Arms
14	Breadline Circle	4
15	Mora Bhagal Char Rasta	4
16	S K Nagar Chokdi	4
17	Archana School	3

8. Annexure II: Functional requirements

Functional requirements of the Adaptive Traffic Control System

8.1. Adaptive Traffic Control System

#	Building Blocks
1	Traffic Signal Controller
2	Vehicle Detectors
3	Communication Network

8.1.1. Traffic Signal Controller

#	Description	Bidder Compliance(Yes/No)
1	The Traffic Signal Controller equipment is a 32 bit or 64 bit microcontroller with solid state traffic signal lamp switching module with the ability to program any combination of traffic signal stages, phases and junction groups. The controller will ideally have a conflict monitoring facility to ensure that conflicting, dangerous are pre-flagged at the programming stage and these are disallowed even during manual override phase.	
2	The Traffic Signal Controller will be adaptive so that it can be controlled through the central traffic control center as an individual junction or as part of group of traffic junctions along a corridor or a region. The signal controller design must be flexible for the junction could be easily configured to be part of any corridor or group definition and could be changed through central command controller easily	
3	Site specific configuration data shall be stored in a non-volatile memory device (FLASH memory) easily programmable at the site through keypad or laptop. A minimum of 512KB flash memory and 128KB RAM shall be provided. Volatile memory shall not be used for storing the junction specific plans or signal timings.	
4	All timings generated within a traffic signal controller shall be digitally derived from a crystal clock which shall be accurate to plus or minus 100 milliseconds.	
5	The controller shall provide a real time clock (RTC) with battery backup that set and update the time, date and day of the week from the GPS. The RTC shall have minimum of 10 years battery backup with maximum time tolerance of (+/-) 2 sec per day.	

#	Description	Bidder Compliance(Yes/No)
6	The controller shall have the facility to update the RTC time from ATCS server, GPS and through manual entry.	
7	The controller shall be capable of communicating with the ATCS server through Ethernet on a managed leased line network or any other appropriate stable communication network.	

A) Police Panel

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

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

B) Modes of Operation

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

#	Description	Bidder Compliance(Yes/No)
1	Fixed Time: In fixed time (pre-timed) mode the traffic signal controller shall execute stage timings according to the site	

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

#	Description	Bidder Compliance(Yes/No)
	possible in this mode. The traffic signal controller shall identify a communication failure with the central computer within a specified time period. In such an event the signal plan timings shall be executed from the local timetable stored in the traffic signal controller FLASH memory. Fallback mode of the traffic signal controller shall be vehicle actuated. On restoration of the communication with central computer the traffic signal controller shall automatically resort to FATCS mode. The traffic signal controller shall accept commands for remote selection / de-selection of the following from the Central Computer at TCC. Hurry Call Flashing Amber / Flashing Red Junction Off If not reverted to the normal operation within the time period listed below, the traffic signal controllers shall timeout the commands and operate normally Hurry Call – 5 Minutes Flashing Amber / Flashing Red – 30 Minutes Junction Off – 30 Minutes The traffic signal controller shall report the following to the Central Computer through the communication network every cycle or on an event as appropriate. Green time actually exercised for each approach (stage preemption timing) against the Green running period set for the approach by the Central Computer Mode of Operation Lamp failure, if any Output short circuit, if any Detector failure, if any	

C) Traffic Signal Controller Operating Parameters

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

#	Description	Bidder Compliance(Yes/No)
1	It shall be possible to operate the filter green (turning right signal) along with a vehicular phase. The filter green signal shall flash for a time period equal to the clearance amber period at timeout when operated with a vehicular phase.	

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#	Description	Bidder Compliance(Yes/No)
2	The pedestrian phase signal shall be configured for flashing red or flashing green aspect during pedestrian clearance.	
3	It shall be possible to configure any phase to the given lamp numbers at the site.	
4	Stages – The controller shall have facility to configure 32 Stages	
5	Cycle Plans – The controller shall have facility to configure 24 Cycle Plans and the Amber Flashing / Red Flashing plan. It shall be possible to define different stage switching sequences in different cycle plans. The controller shall have the capability for a minimum of 32 cycle-switching per day in fixed mode of operation.	
6	Day Plans – The controller shall have facility to configure each day of the week with different day plans. It shall also be possible to set any of the day plans to any day of the week. The controller shall have the capability to configure 20 day plans.	
7	Special Day Plans – The controller shall have facility to configure a minimum of 20 days as special days in a calendar year.	
8	Starting Amber – During power up the controller shall initially execute the Flashing Amber / Flashing Red plan for a time period of 3 Seconds to 10 Seconds. The default value of this Starting Amber is 5 Seconds. Facility shall be available to configure the time period of Starting Amber within the given limits at the site.	
9	Inter-green – Normally the inter-green period formed by the clearance Amber and Red extension period will be common for all stages. However, the controller shall have a facility to program individual inter-green period from 3 Seconds to 10 Seconds.	
10	Minimum Green – The controller shall allow programming the Minimum Green period from 5 Seconds to 10 Seconds without violating the safety clearances. It should not be possible to preempt the Minimum Green once the stage start commencing execution.	
11	All Red – Immediately after the Starting Amber all the approaches should be given red signal for a few seconds before allowing any right of way, as a safety measure. The controller shall have programmability of 3 Seconds to 10 Seconds for All Red signal.	
12	Signal lamps monitoring – The controller shall have inbuilt circuitry to monitor the lamp status	

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

D) Input and Output facilities

#	Description	Bidder Compliance(Yes/No)
1	Lamp Switching: The controller shall have maximum 64 individual output for signal lamp switching, configurable from 16 to 32 lamps. The signal lamps shall be operating on appropriate DC/AC voltage of applicable rating	
2	Detector Interface: A minimum of 16 vehicle detector inputs shall be available in the controller. All detector inputs shall be optically isolated and provided with LED indication for detection of vehicle.	
3	Communication Interface: The traffic signal controller shall support Ethernet interface to communicate with the ATCS server	
4	Power Saving: The traffic signal controller shall have a facility to regulate the intensity of signal lamps during different ambient light conditions thereby saving energy.	
5	Real-time Clock (RTC): The GPS receiver for updating time, date and day of the week information of the traffic signal controller should be an integral part of the traffic signal controller.	
	The traffic signal controller shall update the date, time and day of the week automatically from GPS during power ON and at scheduled intervals.	

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#	Description	Bidder Compliance(Yes/No)
	Manual entry for date, time and day of week shall be provisioned for setting the traffic signal controller RTC (Real Time Clock).	
	It shall be possible to set the RTC from the Central Server when networked	
6	Keypad (optional): The traffic signal controller shall have a custom made keypad or should have provision for plan upload and download using PC/laptop/Central Server	
7	Operator Display (optional): The traffic signal controller shall optionally have a LED backlit Liquid Crystal Display (LCD) as the operator interface.	

8.1.2. Camera based Vehicle Detector

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

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

8.1.3. Communication Network

Function of the Communication network is for remote monitoring of the intersection and its management.   Real time data (like RTC time, stage timing, mode, events, etc) from the traffic signal controller is required to be sent to the Central Computer in Traffic Management Centre. Central Computer running the ATCS application shall calculate and send optimum signal timings

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to all intersections in the corridor. The contractor shall clearly specify the bandwidth requirements and the type of network recommended for the ATCS.

The contractor shall specify the networking hardware requirements at the Traffic Management Centre and remote intersections for establishing the communication network

8.2. Functional Requirements of the Red Light Violation Detection System

#	SYSTEM PARAMETER	Bidder Compliance (Yes/No)
1	**General**	
a.	The following Traffic violations to be automatically detected by the system by using appropriate Non-Intrusive sensors technology: The system should have both provisions to detect red light status by taking the signal feed from the traffic signal controller as well as by video analytics method using another camera (Evidence Camera) focused at the red light. The Evidence camera should also be used for evidence snap generation. RLVD system should capture the image/Video in day as well as in night. The evidence camera shall capture the status of red light in colour during night time. a) Red Light Violation b) Stop Line Violation	
b.	The system should be capable of capturing multiple infracting vehicles simultaneously in Different lanes on each arm at any point of time with relevant infraction data like: a) Type of Violation b) Date, time, Site Name and Location of the Infraction c) Registration Number of the vehicle through ANPR Camera system for each vehicle identified for infraction.	
c.	The system should be equipped with a camera system to record a digitized image and video of the violation, covering the violating vehicle with its surrounding and current state of signal (Red/Green/Amber) by which the system should clearly show nature of violation and proof thereof :- a) When it violates the stop line. b) When it violates the red signal.	

#	SYSTEM PARAMETER	Bidder Compliance (Yes/No)
	c) Besides, a closer view indicating readable registration number plate patch of the violating vehicle for court evidence for each violation. The system must have in-built tool to facilitate the user to compose detail evidence by stitching video clips from any IP camera in the junction (including but not limited to the red light violation detection camera, evidence camera), and any other surveillance cameras in the vicinity of the spot of incidence. The entire evidence should be watermarked and encrypted to stand the court of law.	
d.	The system shall be able to detect all vehicles infracting simultaneously in each lane/ arm at the junction as per locations provided. It should also be able to detect the vehicles infracting serially one after another in the same lane. The vehicles should be clearly identifiable and demarcated in the image produced by the camera system.	
e.	The Evidence image produced by the system should be wide enough to give the exact position of the infracting vehicles with respect to the stop line and clearly indicate colour of the Traffic light at the instant of Infraction even if any other means is being used to report the colour of the light.	
f.	The system should interface with the traffic controller to validate the colour of the traffic signal reported at the time of Infraction so as to give correct inputs of the signal cycle.	
g.	The Evidence and ANPR camera should continuously record all footage in its field of view to be stored at the local base station. This should be extractable onto a portable device as and when required.The option of live viewing of evidence cameras from the locations shall be available at the TCC. The network should have the capability to provide the real time feed of the evidence camera to the TCC at the best resolution possible on the available network.	
h.	The system shall be equipped with IR Illuminator to ensure clear images including illumination of the Number Plate and capture the violation image under low light conditions and night time.	

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

#	SYSTEM PARAMETER	Bidder Compliance (Yes/No)
i.	In the event that the connectivity to the TCC is not established due to network/connectivity failures, then all data pertaining to the infraction shall be stored on site and will be transferred once the connectivity is re-established automatically. There shall also be a facility of physical transfer of data on portable device whenever required. There should be a provision to store minimum **one week** of data at each site on a 24x7 basis.	
4	**Mounting structure**	
a.	Should be cantilever mounted and shall have minimum 6 Mtrs. height with appropriate vertical clearance under the system from the Road surface to ensure no obstruction to vehicular traffic.	
b.	It should be capable to withstand high wind speeds and for structural safety, the successful bidder has to provide structural safety certificate from qualified structural engineers approved/ certified by Govt. Agency.	
c.	It shall be painted with one coat of primer and two coats of PU paint. The equipment including poles, mountings should have an aesthetic feel keeping in mind the standards road Infrastructure (e.g Poles, Navigation boards etc) currently installed at these locations. The equipment should look "one" with the surroundings of the location and not look out of place.	
d.	Rugged locking mechanism should be provided for the onsite enclosures and cabinets.	
5	**RLVD Application**	
a.	It should be capable of importing violation data for storage in database server which should also be available to the Operator for viewing and retrieving the violation images and data for further processing. The programme should allow for viewing, sorting, transfer & printing of violation data.	
b.	It should generate the photograph of violations captured by the outstation system which include a wider view covering the violating vehicle with its surrounding and a closer view indicating readable registration number plate patch of the violating vehicle or its web link on notices for court evidence.	

#	SYSTEM PARAMETER	Bidder Compliance (Yes/No)
c.	All outstation units should be configurable using the software at the Central Location.	
d.	Violation retrieval could be sorted by date, time, location and vehicle registration number and the data structure should be compatible with Surat Police database structure. It should also be possible to carry out recursive search and wild card search.	
e.	The operator at the back office should be able to get an alarm of all fault(s) occurring at the camera site (e.g. sensor failure, camera failure, failure of linkage with traffic signal, connectivity failure, Camera tampering, sensor tampering).	
f.	The automatic number plate recognition Software will be part of the supplied system, Success rate of ANPR will be taken as 80% or better during the day time and 60% or better during the night time with a standard number plate.	
g.	The application software should be integrated with the E Challan software for tracing the ownership details of the violating vehicle and issuing/printing notices. Any updates of the software (OS, Application Software including any proprietary software), shall be updated free of cost during the contract period by the SI.	
h.	Image zoom function for number plate and images should be provided. In case the number plate of the infracting vehicle is readable only through the magnifier then in such cases the printing should be possible along with the magnified image.	
i.	Various users should be able to access the system using single sign on and should be role based. Different roles which could be defined (to be finalized at the stage of SRS) could be Administrator, Supervisor, Officer, Operator, etc.	
j.	Apart from role based access, the system should also be able to define access based on location.	
k.	Rights to different modules / Sub-Modules / Functionalities should be role based and proper log report should be maintained by the system for such access.	
l.	Components of the architecture must provide redundancy and ensure that there are no single points of failure in the key project components. Considering the high sensitivity of the system, design shall be in such a way as to be resilient to	

#	SYSTEM PARAMETER	Bidder Compliance (Yes/No)
	technological sabotage. To take care of remote failure, the systems need to be configured to mask and recover with minimum outage.	
m.	The architecture must adopt an end-to-end security model that protects data and the infrastructure from malicious attacks, theft etc. Provisions for security of field equipment as well as protection of the software system from hackers and other threats shall be a part of the proposed system. Using Firewalls and Intrusion detection systems such attacks and theft shall be controlled and well supported (and implemented) with the security policy. The virus and worms attacks shall be well defended with Gateway level Anti-virus system, along with workstation level Anti-virus mechanism. There shall also be an endeavour to make use of the SSL/VPN technologies to have secured communication between Applications and its end users. Furthermore, all the system logs shall be properly stored & archived for future analysis and forensics whenever desired.	
n.	The evidence of Infraction should be encrypted and protected so that any tampering can be detected.	
o.	Ease of configuration, ongoing health monitoring, and failure detection are vital to the goals of scalability, availability, and security and must be able to match the growth of the environment.	
p.	System shall use open standards and protocols to the extent possible and declare the proprietary software wherever used.	
q.	The user interface should be user friendly and provide facility to user for viewing, sorting and printing violations. The software should also be capable of generating query based statistical reports on the violation data.	
r.	The data provided for authentication of violations should be in an easy to use format as per the requirements of user.	
s.	User should be provided with means of listing the invalid violations along with the reason(s) of invalidation without deleting the record(s).	

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#	SYSTEM PARAMETER	Bidder Compliance (Yes/No)
t.	Basic image manipulation tools (zoom etc.) should be provided for the displayed image but the actual recorded image should never change.	
u.	Log of user actions be maintained in read only mode. User should be provided with the password and ID to access the system along with user type (admin, user).	
v.	Image should have a header/footer depicting the information about the site IP and violation details like date, time, equipment ID, location ID, Unique ID of each violation, lane number, Regn. Number of violating vehicle and actual violation of violating vehicle etc. so that the complete lane wise junction behaviour is recorded including (Red Light violation and Stop Line Violation)	
w.	Number plate should be readable automatically by the software/interface. There should be user interface for simultaneous manual authentication / correction and saving as well.	
x.	Interface for taking prints of the violations (including image and above details).	

8.3. Functional Requirements of the Speed Violation Detection System

#	SYSTEM PARAMETER	Bidder Compliance (Yes/No)
1	**General**	
a.	The Speed Violations should be automatically detected by the system by using appropriate sensors technology. Spot speed detection is required in Speed violation system	
b.	The system should be capable of capturing multiple infracting vehicles simultaneously in defined lanes at any point of time simultaneously with relevant infraction data like: a) Type of Violation b) Speed of violating vehicle c) Notified speed limit d) Date, time, Site Name and Location of the Infraction e) Registration Number of the vehicle through ANPR Camera system	

#	SYSTEM PARAMETER	Bidder Compliance (Yes/No)
	for each vehicle identified for infraction	
c.	The system should be equipped with a camera system to record a digitized image or video frames of the violation, covering the violating vehicle with its surrounding	
d.	The system shall provide the No. of vehicles infracting simultaneously in each lane. The vehicles will be clearly identifiable and demarcated in the image produced by the camera system	
e.	The system shall be equipped with IR Illuminator to ensure clear images including illumination of the Number Plate and capture the violation image under low light conditions and night time.	
2	**Speed**	
a.	Speed measurement may be made by using non-intrusive technology such as Radar/sensor/camera/virtual based or any other appropriate certified technology. CE and homologation certificate from Ministry of Traffic or equivalent department from respective country of origin, document authenticated by Indian Embassy (to authenticate that systems are legalized and tested for infractions to avoid legal issues) or Certificate from internationally accredited metrology laboratories (approved for speed calibration) is acceptable	
3	**On site-out station processing unit communication & Electrical Interface**	
a.	The system should automatically reset in the event of a program hang up and restart after power failure.	
b.	The system should have secure access mechanism for validation of authorised personnel	
c.	Deletion or addition and transfer of data should only be permitted to authorised users.	
d.	A log of all user activities should be maintained in the system	
e.	Roles and Rights of users should be defined in the system	

#	SYSTEM PARAMETER	Bidder Compliance (Yes/No)
f.	The data shall be transferred to the TCC in real time for verification of the infraction and processing of challan.	
g.	In the event that the connectivity to the TCC is not established then all data pertaining to the infraction shall be stored on site and will be transferred once the connectivity is re-established automatically.	
4	**Mounting structure**	
a.	Should be cantilever mounted and shall have minimum 6 Mtrs. height with appropriate vertical clearance under the system from the Road surface to ensure no obstruction to vehicular traffic.	
b.	It should be capable to withstand high wind speeds and for structural safety, the successful bidder has to provide structural safety certificate from qualified structural engineers approved/ certified by Govt. Agency.	
c.	Rugged locking mechanism should be provided for the onsite enclosures and cabinets.	
5	**Speed Violation Application**	
a.	It should be capable of importing violation data for the Operator for viewing and retrieving the violation images and data for further processing. The programme should provide for sort, transfer & print command.	
b.	It should print the photograph of violations captured by the outstation system which include a wider view covering the violating vehicle with its surrounding and a closer view indicating readable registration number plate patch of the violating vehicle or its web link on notices for court evidence.	
c.	All outstation units should be configurable using the software at the Central Location	
d.	Violation retrieval could be sorted by date, time, location and vehicle registration number and data structure should be compatible with Surat Traffic Police database and Surat Transport department database structure.	
e.	The operator at the back office should be able to get an alarm of any possible fault(s) at the camera site (outstand) (e.g.	

#	SYSTEM PARAMETER	Bidder Compliance (Yes/No)
	sensor failure, camera failure, failure of linkage with traffic signal, connectivity failure, Camera tampering , sensor tampering)	
f.	The automatic number plate recognition Software may be part of the supplied system, or can be provided separately as add on module to be integrated with violation detection. a.) Success rate of ANPR will be taken as 80% or better during the day time and 60% or better during the night time on standard number plates.	
g.	Image zoom function for number plate and images should be provided. Any updates of the software available, shall be updated free of cost during the contract period by the vendor and will integrate the same with existing application and database of Surat Traffic Police and Surat Transport department.	
h.	The application software should be integrated with the notice branch software for tracing the ownership details of the violating vehicle and issuing/printing notices.	
i.	Various users should be access the system using single sign on and should be role based. Different roles which could be defined (to be finalized at the stage if SRS) could be Administrator, Supervisor, Officer, Operator, etc.	
j.	Apart from role based access, the system should also be able to define access based on location.	
k.	Rights to different modules / Sub-Modules / Functionalities should be role based and proper log report should be maintained by the system for such access	
l.	Important technical components of the architecture must support scalability to provide continuous growth to meet the growing demand of Surat Police. The system shall support vertical scalability so that depending on changing requirements from time to time, the system may be scaled upwards. There must not be any system imposed restrictions on the upward scalability. Main technological components requiring scalability are Storage, Bandwidth, Computing Performance (IT Infrastructure), Software / Application performance and advancement in proposed system features.	

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#	SYSTEM PARAMETER	Bidder Compliance (Yes/No)
m.	The system shall also support horizontal scalability so that depending on changing requirements from time to time, the system may be scaled horizontally.	
n.	Components of the architecture must provide redundancy and ensure that are no single point of failures in the key project components. Considering the high sensitivity of the system, design shall be in such a way as to be resilient to technological sabotage. To take care of remote failure, the systems need to be configured to mask and recover with minimum outage.	
o.	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 Anti-virus mechanism. There shall also be an endeavour to make use of the SSL/VPN technologies to have secured communication between Applications and its end users. Furthermore, all the system logs shall be properly stored & archived for future analysis and forensics whenever desired.	
p.	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.	
q.	System shall use open standards and protocols to the extent possible	
r.	The user interface should be user friendly and provide facility to user for viewing, sorting and printing violations. The software should also be capable of generating query based statistical reports on the violation data.	
s.	The data provided for authentication of violations should be in an easy to use format as per the requirements of user unit.	

#	SYSTEM PARAMETER	Bidder Compliance (Yes/No)
t.	User should be provided with means of listing the invalid violations along with the reason(s) of invalidation without deleting the record(s).	
u.	Basic image manipulation tools (zoom etc.) should be provided for the displayed image but the actual recorded image should never change.	
v.	Log of user actions be maintained in read only mode. User should be provided with the password and ID to access the system along with user type (admin, user).	
w.	Image should have a header and footer depicting the information about the site IP and violation details like viz. date, time, equipment ID, location ID, Unique ID of each violation, lane number, Regn. Number of violating vehicle and actual violation of violating vehicle etc. so that the complete lane wise junction behaviour is recorded viz. (Speed of violating vehicle, notified speed limit, Speed Violation with Registration Number Plate Recognition facility.)	
x.	Number plate of cars, buses/HTVs should be readable automatically by the software/interface. There should be user interface for simultaneous manual authentication / correction and saving as well.	
y.	Interface for taking prints of the violations (including image and above details).	

8.4. Functional Requirements of the Mid-Block Variable Message Signage System

#	Description	Bidder Compliance (Yes/No)
1.	**System Requirements**	
a.	The system should be capable to display warnings, traffic advice, route guidance and emergency messages to motorists from the TCC in real time.	
b.	The system should also be capable to display warnings, traffic advice, route guidance and emergency messages to motorist by using local PC/Laptops. The system should display graphical representation of the lanes with directional arrows	

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

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#	Description	Bidder Compliance (Yes/No)
	shall be provided with sufficient security check to avoid unauthorized access.	
2.	**Variable Message Sign board application**	
a.	Central Control Software allows controlling multiple VMS from one console.	
b.	Capable of programming to display all types of Message/ advertisement having alphanumeric character in English, Hindi, Gujarathi and combination of text with pictograms signs.. The system should have feature to manage video / still content for VMS display. The system should have capability to divide VMS screen into multi-parts to display diverse form of information like video, text, still images, advertisements, weather info, city info etc. The system should also provide airtime management and billing system for paid content management	
c.	Capable of controlling and displaying messages on VMS boards as individual/ group.	
d.	Capable of controlling and displaying multiple font types with flexible size and picture sizes suitable as per the size of the VMS.	
e.	Capable of controlling brightness & contrast through software.	
f.	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.	
g.	Real time log facility – log file documenting the actual sequence of display to be available at central control system.	
h.	Multilevel event log with time & date stamp.	
i.	Access to system only after the authentication and acceptance of authentication based on hardware dongle with its log.	
j.	Location of each VMS will be plotted on GIS Map with their functioning status which can be automatically updated.	
k.	Report generation facility for individual/group/all VMSs with date and time which includes summary of messages,	

#	Description	Bidder Compliance (Yes/No)
	dynamic changes, fault/repair report and system accessed logs, link breakage logs, down time reports or any other customized report.	
l.	Configurable scheduler on date/day of week basis for transmitting pre-programmed message to any VMS unit.	
m.	Various users should access the system using single sign on and should be role based. Different roles which could be defined (to be finalized at the stage of SRS) could be Administrator, Supervisor, Officer, Operator, etc.	
n.	Apart from role based access, the system should also be able to define access based on location.	
o.	Rights to different modules / Sub-Modules / Functionalities should be role based and proper log report should be maintained by the system for such access	
p.	Components of the architecture 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.	
q.	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 Anti-virus mechanism. There shall also be an endeavour to make use of the SSL/VPN technologies to have secured communication between Applications and its end users. Furthermore, all the system logs shall be properly stored & archived for future analysis and forensics whenever desired.	
r.	Ease of configuration, ongoing health monitoring, and failure detection are vital to the goals of scalability, availability, and	

#	Description	Bidder Compliance (Yes/No)
	security and must be able to match the growth of the environment.	
s.	System shall use open standards and protocols to the extent possible	
t.	Facility to export reports to excel and PDF formats.	
3.	**Remote Monitoring**	
a.	All VMS shall be connected/configured to Traffic Monitoring Centre for remote monitoring through network for two way communication between VMS and control Room to check system failure, power failure & link breakage.	
b.	Remote Diagnostics to allow identifying failure up to the level of failed individual LED.	

8.5. Requirements for Integration with existing E Challan application

The System Integrator is required to integrate the proposed traffic enforcement systems with existing E-Challan system running at Police Command Centre. The integration should adhere to following minimum requirements:

#	Minimum Requirements	Bidder Compliance(Yes/No)
1	The SI shall design the integration platform to automatically generate traffic challans based on infractions received from the proposed RLVD, Speed Violation Detection and Traffic Violation camera systems	
2	The operators for the e challan system are residing at the Police Command Center from where the back office operations for verification of traffic violation are being undertaken. The SI shall provision the network connectivity from TCC to Police Command Center for transferring the data feeds received at TCC from field devices to Police Command Center.	
3	Providing requisite structured/unstructured information to the traffic management officials as and when required.	
4	Generating various statutory reports for the administrative use and functioning of the Traffic unit in matters of	

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#	Minimum Requirements	Bidder Compliance(Yes/No)
	prosecution of violators and monitoring the functioning of field officers.	

8.6. Functional Requirement of the Traffic Surveillance Cameras

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

1. Information to be Captured by Edge Devises

2. Information to be analysed at Traffic Command Center

3. Role Based Access to the Entire System

4. Storage / Recording Requirements

5. Other General Requirements

8.6.1. Information to be captured by Edge Devices

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

It is recommended to clearly identify in SLAs that cameras need to transmit quality video feed (appropriately focused, clear, un-blurred, jitter free, properly lit, unobstructed, etc.). Packet loss is to be less than 0.5 percent.

8.6.2. Information to be analyzed at Traffic Command Center

#	Minimum Requirements	Bidder Compliance(Yes/No)
1	The proposed Video Management System should provide a complete end-to-end solution for security surveillance application. The control centre shall allow an operator to view live / recorded video from any traffic surveillance camera on the IP network. The combination of control centre and the IP network would create a virtual matrix, which would allow switching of video streams around the system	

As informed in the Tender, not all the traffic surveillance cameras would be simultaneously viewed at Traffic Command Centre. The viewing shall vary from time to time which will help to manage traffic at the junctions and coordinate with the field traffic officers.

Video management system should have event alert facility over E-Map. Alert Pop-Ups/Notification along with live video stream of the camera (At ECB) will be triggered, if someone activate emergency calling button. In future E-Map should be migrated to GIS platform that is being developed by SMC.

8.6.3. Role Based Access to the Entire System

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

#	Minimum Requirements	Bidder Compliance(Yes/No)
1	The management module should be able to capture basic details (including mobile number & email id) of the Police Personnel & other personnel requiring Viewing / Administration rights to the system. There should be interface to change these details, after proper authentication.	
2	Rights to different modules / sub-modules / functionalities should be role based and proper log report should be maintained by the system for such access.	

#	Minimum Requirements	Bidder Compliance(Yes/No)
3	The system should be with login name & password enabled to ensure that only the concerned personnel are able to login into the system	
4	There should be provision to specify hierarchy of operators / officers for control of the cameras from various locations.	
5	The number of users shall increase as per phase wise implementation. SI is expected to estimate and provision the same based on the phase wise requirements given in RFP. Windows Active Directory/LDAP or any such system can be used to design role based access.	

8.6.4. Storage/Recording Requirements

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

a) There will be DC at TCC

b) 30 days storage of all the traffic surveillance camera feeds to be stored at Data Centre and Flagged data (critical incidents) will be stored for approximately 90 days, permanent storage envisaged on secondary/backup storage

c) 90 days storage for all traffic enforcement systems including RLVD, Speed Violation Detection, Traffic violation cameras and ANPR camera at Data Centre.

d) 365 days storage of traffic junction data for ATCS at Data Centre and Flagged data will be stored for approximately 5 years.

e) Above systems except ATCS are required to be stored on Primary storage for 7 days & on Secondary Storage for remaining days respectively at Data Centers.

f) For ATCS, Primary storage will be for 90 days and Secondary Storage for 275 days. Back up storage for 5 Years approximately.

g) Data on storage would be over-written automatically by newer data after the stipulated time period. If some data is flagged by police personnel (or by designated personnel) as important data / evidence data due to some reporting of crime or accident in the area or due to court order or due to suspicious activity, it would need to be stored for longer duration, as per requirements. Surat Traffic Police would analyses such flagged data every 3months to take such decisions for preservation of the flagged data beyond 90 days.

h) Full audit trail of reports to be maintained for 90 days.

i) Bidder is expected to carry out the storage requirement estimation and supply as per the solution proposed.

Minimum Storage Requirement

#	Minimum Storage Requirement	TB
1	Primary Storage	50
2	Secondary Storage	285
3	Back up Storage	30
	Total	365

Please refer **Annexure III** of this document of Tender for specifications for storage.

#	Minimum Requirements	Bidder Compliance(Yes/No)
1	Retrieval time for any data stored on secondary storage should be max. 4 hours for critical data & 8 hours for other data.	
2	The recording servers / system, once configured, shall run independently of the Video Management system and continue to operate in the event that the Management system is off-line.	
3	The system shall support the use of separate networks, VLANs or switches for connecting the cameras to the recording servers to provide physical network separation	

#	Minimum Requirements	Bidder Compliance(Yes/No)
	from the clients and facilitate the use of static IP addresses for the devices.	
4	The system shall support H.264 or better, MPEG-4 and MJPEG compression formats for all analog cameras connected to encoders and all IP cameras connected to the system.	
5	The system shall record the native frame rate and resolution supplied by the camera or as configured by the operator from the system administration server.	
6	The system should not limit amount of storage to be allocated for each connected device.	
7	The on-line archiving capability shall be transparent and allow Surat Traffic Police to browse and archive recordings without the need to restore the archive video to a local hard drive for access.	
8	The system shall allow for the frame rate, bit rate and resolution of each camera to be configured independently for recording. The system shall allow the user to configure groups of cameras with the same frame rate, bit rate and resolution for efficient set-up of multiple cameras simultaneously.	
9	The system shall support archiving or the automatic transfer of recordings from a camera's default database to another location on a time-programmable basis without the need for user action or initiation of the archiving process. Archiving shall allow the duration of the camera's recordings to exceed the camera's default database capacity. Archives shall be located on either the recording server or on a connected network drive. If the storage area on a network drive becomes unavailable for recording the system should have the ability to trigger actions such as the automatic sending of email alerts and sound alerts to necessary personnel.	

#	Minimum Requirements	Bidder Compliance(Yes/No)
	Bandwidth optimization	
10	The Recording Server / System shall offer different codec (H.264, MJPEG, MPEG-4, etc.) frame rate & Resolution (1080P, 960P, 720P, 4CIF, CIF, QCIF) options for managing the bandwidth utilisation for live viewing on the Client systems. (through use of multiple systems such as transcoding server)	

8.6.5. Other General Requirements

Management/Integration functionality

#	Minimum Requirements	Bidder Compliance(Yes/No)
1	The Surveillance System shall offer centralized management of all devices, servers and users.	
2	The Surveillance System should not have any limit on the number of cameras to be connected for Surveillance, Monitoring and recording. Any increase in the no. of cameras should be possible by augmentation of Hardware components.	
3	The Surveillance System should have ability to knit the video streams from multiple cameras, based on the date/time stamp. Every video stream shall have date, time, source camera location, FPS etc. water-marked. These attributes shall be finalized at the System Design time. There shall be a centralized NTP server, from which all devices shall synchronize the date and time.	
4	The Surveillance System shall support distributed viewing of any camera in the system using Video walls or big screen displays.	
5	The Surveillance System shall support alarm management. The alarm management shall allow for the continuous monitoring of the operational status and event-triggered alarms from system servers, cameras and other external devices.	
6	It should be possible to integrate the Surveillance System with 3rd-party software, to enable the users to develop customized	

#	Minimum Requirements	Bidder Compliance(Yes/No)
	applications for enhancing the use of video surveillance solution. For e.g., integrating alarm management to initiate SMS, E-Mail, VoIP call etc.	
7	It should be possible to integrate social media platforms to Surveillance System to enable Surat Traffic Police to track and monitor certain trending incident or crime.	
8	The Management system shall store the overall network elements configuration in central database, either on the management server computer or on a separate DB Server on the network.	
9	System should be able to be integrated with Event Management / Incident Management System, if implemented by Surat Traffic Police in future.	
10	From the Surat Traffic Police, the user shall have the option of having video images continually streamed or only updated on motion to conserve bandwidth between the Client systems and the Recording Server.	
11	The Recording Server / System shall support camera (analogue and IP cameras) devices from various manufacturers.	
12	The Recording Server / System shall support the PTZ protocols of the supported devices listed by the camera OEMs.	
13	The system shall support full two-way audio between Client systems and remote devices. (Audio from certain set of cameras can be recorded in future).	
14	**Failover Support**	
a.	The system shall support automatic failover for recording servers. This functionality shall be accomplished by failover server as a standby unit that shall take over in the event that one of a group of designated recording servers fails. Recordings shall be synchronized back to the original recording server once it is back online.	
b.	The system shall support multiple failover servers for a group of recording servers.	
15	**SNMP Support**	

#	Minimum Requirements	Bidder Compliance(Yes/No)
a.	The system shall support Simple Network Management Protocol (SNMP) in order for third-party software systems to monitor and configure the system.	
b.	The system shall act as an SNMP agent which can generate an SNMP trap as a result of rule activation in addition to other existing rule actions.	

System Administration functionality

#	Minimum Requirements	Bidder Compliance(Yes/No)
1	The System Administration Server shall provide a feature-rich administration client for system configuration and day-to-day administration of the system	
2	The System Administration Server shall support different logs related to the Management Server • The System Log • The Audit Log • The Alert Log • The Event Log	

Rules

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

#	Supported Rules	Bidder Compliance(Yes/No)
1	Start and stop recording	
2	Set non-default live frame rate	
3	Set non-default recording rate	
4	Start and stop PTZ patrolling	
5	Send notifications via email	
6	Pop-up video on designated Client Monitor recipients	

Client System

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

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

Remote Web Client

#	Functionality	Bidder Compliance(Yes/No)
1	The web-based remote client shall offer live view of up to 16 cameras, including PTZ control and event / output activation. The Playback function shall give the user concurrent playback of multiple recorded videos with date, alert sequence or time searching.	
a.	User Authentication – The Remote Client shall support logon using the user name and password credentials	
2	**Matrix Monitor**	

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#	Functionality	Bidder Compliance(Yes/No)
a.	Matrix Monitor – The Matrix Monitor feature shall allow distributed viewing of multiple camera on the system on any monitor	
b.	The Matrix Monitor feature shall access the H.264/MJPEG/MPEG4 stream from the connected camera directly and not sourced through the recording server	
3	**Alarm Management Module**	
	The alarm management module shall allow for continuous monitoring of the operational status and event-triggered alarms from various system servers, cameras and other devices. The alarm management module shall provide a real-time overview of alarm status or technical problems while allowing for immediate visual verification and troubleshooting.	
a.	The alarm management module shall provide interface and navigational tools through the client including; • Graphical overview of the operational status and alarms from servers, network cameras and external devices including motion detectors and access control systems. • Intuitive navigation using a map-based, hierarchical structure with hyperlinks to other maps, servers and devices or through a tree-view format.	
b.	The module shall include flexible access rights and allow each user to be assigned several roles where each shall define access rights to cameras.	
c.	Basic VMS should be capable to accept third party generated events / triggers Based on alarms/alerts, customized/standard alert messages should be published on VMB/PA, after authorization by a supervisor/operator	

Other Miscellaneous Requirements

#	Minimum Requirements	Bidder Compliance(Yes/No)
1	System should have a facility to create CDs or other storage media for submission to Judiciary, which can be treated evidence for legal matters. Such storage media creation	

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#	Minimum Requirements	Bidder Compliance(Yes/No)
	should be tamper proof and SI to provide appropriate technology so that integrity and quality of evidence is maintained as per requirements of the judiciary. Bidder is required to specify any additional hardware / software required for this purpose & the same can be listed in miscellaneous section of the commercial bid. SI will also prepare the guideline document to be followed by the Police Personnel for the retrieval of Video / images from the CCTV System so as to maintain integrity of the evidence. Such a guideline document should include methods of retrieval of data, check-list to be followed and flowchart of the entire process to be followed.	
2	Video clips should be converted into .AVI file which can be used by the Police as an evidence	
3	All the systems proposed and operationalization of Video Management System should comply with requirements of IT Acts.	
4	Any hardware or software required to achieve the functional requirement and technical solution of the overall Project (may not be not specified in the schedule) is to be proposed in the Bid and borne by the SI.	
5	Surveillance System being implemented a part of this project, and ensure that all the necessary access is given to these mobile users. Functionalities to be provided through mobile application: Viewing of any video steam from Central VMS, uploading of video / pictures central VMS, Location based GIS Map access, tagging of mobile device/location information for all relevant functionalities.	

8.7. Functional Requirement of the Traffic Analytics application Platform for Citizen Decision Support System

The Traffic Analytics application platform will help the citizens to take decisions to suggest the citizens on best routes to be taken while commuting. It will undertake predictive analysis and provide the citizens with options of best possible routes and rerouting options. Below are the functional scope.

1. **Collecting Traffic Information**: The system will collect traffic information from camera installed and capture various traffic related data points for further analysis leading to traffic decision support

2. **Process Traffic Information:** The collected information & data points are used to understand traffic characteristics and basis of analytics suggest options to commuters for faster journey times and thus aid in reduction of traffic congestion.

3. **Smart Analytics:** The System should identify the count of vehicles, speed, occupancy etc.
   - **Vehicle Speed** – The speed at which the vehicle passes the camera region.
   - **Average Speed** – The Average speed of the particular zone created during installation.
   - **Occupancy** – Occupancy of the particular zone for particular time period.
   - **Vehicle count** – The number of vehicle passed through the region.

4. **The system should also have capability to define the Traffic events and provide functionalities such as:**
   - Traffic management system shall be able to display real-time as well as static data.
   - Traffic management system shall be a fully customizable solution for each display/ location to show live traffic-related information, live congestion related information specific to the location.
   - Traffic management system solution shall be able to provide real time information like weather updates, alternate route options useful to the citizens in an automated fashion without any manual data feeding.
   - Traffic management system shall have the ability to integrate with disaster management & emergency response data sources to provide instant alerts to public
   - Traffic management system platform shall allow integration with speed violation system for speed monitoring and driver feedback applications to reduce accidents on road.
   - Traffic management system shall allow distribution of emergency messages to specific/all VMS boards via a secure mobile/tablet application.
   - Traffic management system shall be capable of reading live data from road side sensors. Eg. Parking, environmental sensors.

   Any other as desired by Traffic Police or SSCDL or SMC

8.8. Functional Requirement of MIS System

It is expected that selected bidder will develop a MIS system to support decision making in various emergency situations. The inputs for such systems will come from external applications deployed by SMC or other government departments - the selected bidder will be expected to develop

integration mechanism to accept input from external systems. Information broadcasting will be triggered through the TCC developed by the selected bidder - source of data would be external applications deployed by SMC or other government departments or any manual triggers by personnel at command center

8.9. Functional Requirement of the Traffic Web Portal and Mobile Application

The System Integrator shall also develop a web portal and mobile application for the benefit of the citizens to access information regarding the traffic situation in the city, it shall enable the options of providing best routes to be taken for reaching the destinations.

8.10. Functional Scope of Countdown Timer

#	Description	Bidder Compliance (Yes, No)
1	Count Down Timer to be configured in Vehicular Mode.	
2	The Vehicular countdown timer should be dual colour, • Red for Stop or STP • Green colour for Go	
3	There should be alternate Red and Balance phase time for STOP or STP in Flashing	
4	Alternate Green and Balance Phase Time for Go in Flashing	

9.   Annexure III: Technical Specifications

9.1. Adaptive Traffic Control- Traffic Sensor

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

9.2. Adaptive Traffic Control- Traffic Controller

Appropriate controller technology may be chosen to provide the operational levels and accuracy as required for successful integration with the existing ATCS system as per the SLAs defined.

9.3. Adaptive Traffic Control- Traffic Light Aspects

#	Description	Bidder Compliance(Yes/No)
1.	**Key Features:**	
a.	lowest power consumption for all colors	
b.	Meets or exceeds intensity, colour and uniformity specifications	
c.	Temperature compensated power supplies for longer LED life	
d.	Uniform appearance light diffusing	
e.	Should be Intertek/ETL/EN certified	
f.	All units operate at voltage of 230Vac +/- 10% and frequency 50 +/-5Hz	
g.	LED shall be single source narrow beam type with clear lens & Luminance uniformity of 1:15	
h.	Phantom Class 5 or equivalent. IP Rating: IP65	
2	**LED aspects:**	
a.	Red, Amber, Green-Full (300 mm diameter) : Hi Flux	
b.	Green-arrow, BRT: Red & Green (300 mm diameter): Hi flux	
c.	Animated Pedestrian-Red and Green Animated c/w countdown (300 mm) Hi Brite with diffusions	
4	**LED Retrofit Specifications:**	
a.	Power supply:230 Vac +/- 10% and frequency 50+/-5Hz	
b.	Standards: EN 12368 Certified	
c.	Convex Tinted Lense: Available	

#	Description	Bidder Compliance(Yes/No)
d.	Fuse and Transients: Available	
e.	Operating Temperature Range: 0 degree Celsius to 55 degree Celcius Turn Off/Turn On Time: 75 milli seconds max	
f.	Total Harmonic Distortion: <20%	
g.	Electromagnetic interference: Meets FCC Title 47,Subpart B, Section 15 Regulation or equivalent EN/IRC standard	
h.	Blowing Rain/Dust Spec: MIL 810F or Equivalent EN/IRC standard complaint	
i.	Minimum Luminous Intensity (measured at intensity point)(cd): Red 400	
j.	Amber 400	
k.	Green 400	
l.	Dominant Wavelength (nm): Red 630 Amber 590	
m.	Green 490	
n.	Lamp conflict compatibility system: Compatible with lamp failure and conflict detection	
o.	Complete LED Aspect Warranty: 5 Years	

9.4. Countdown Timer

#	Parameters	Minimum Specifications or better	Bidder Compliance (Yes/No)
1	CPU	Micro Controller	
2	Mechanical Specifications		
a	Structural Material	Polycarbonate strengthened against UV rays	
b	Body Color	Light Grey/Black	
c	Dimensions	360mm x 370mm x 220mm	
3	Display Specification		
a	Lamp Diameter	300mm	
b	Digit Height	150 -165mm	
c	Display Type	Dual Coloured (Red & Green)	

#	Parameters	Minimum Specifications or better	Bidder Compliance (Yes/No)
d	No. of Digit	3	
4	**LED Specifications**		
a	LED Diameter	5mm LED	
b	Viewing Angle	30°	
c	LED Wave Length	630-640nm (Red), 505nm - 520nm (Blue-Green)	
d	LED Dice Material	AIInGap (Red), InGaN (Blue-Green)	
e	LED Warranty period	5 years	
5	**Technical Features**		
a	Power Consumption	20 - 30 Watt Per Lamp	
b	Input Power	85-260V AC, 50Hz	
c	Operating Temperature	-20 to + 60 °C	
d	Humidity	0% to 95% Relative Humidity	
e	Water & Dust Ingress	IP 65	
f	Standard	En12966	

9.5. Red Light Violation Detection Systems

#	Parameter	Minimum Specifications	Bidder Compliance(Yes/No)
1	**General**		
	The system should be capable of generating a video & minimum 3 snapshot in any of the standard industry formats (MJPEG, JPG, avi, mp4, mov, etc) with at least 10 frames per second. The video shall be from t-5 to t+5 sec of the violation and should also be recorded (being the instant at which the infraction occurred).		
2.	**Digital Network Camera**		

#	Parameter	Minimum Specifications	Bidder Compliance(Yes/No)
a.	Video Compression	H.264	
b.	Video Resolution	1920 X 1080	
c.	Frame rate	Min. 30 fps	
d.	Image Sensor	1/3" Progressive Scan CCD / CMOS	
e.	Lens Type	Varifocal, C/CS Mount, IR Correction full HD lens	
f.	Lens#	Auto IRIS 5~50mm /8 – 40 mm, F1.4	
g.	Minimum Illumination	Colour: 0.5 lux, B/W: 0.1 lux (at 30 IRE)	
h.	IR Cut Filter	Automatically Removable IR-cut filter	
i.	Day/Night Mode	Colour, Mono, Auto	
j.	S/N Ratio	≥ 50 Db	
k.	Auto adjustment + Remote Control of Image settings	Colour, brightness, sharpness, contrast, white balance, exposure control, backlight compensation, Gain Control, Ture Wide Dynamic Range	
l.	Audio	Audio Capture Capability, G.711, G.726	
m.	Local storage	Micro SDXC up to 64GB (Class 10) In the event of failure of connectivity to the central server the camera shall record video locally on the SD card automatically. After the connectivity is restored these recordings shall be automatically merged with the server recording such that no manual intervention is required to transfer the SD card based recordings to server.	
n.	Protocol	IPV4, IPV6, HTTP, HTTPS, FTP/SMTP, RTSP, RTP, TCP, UDP, RTCP, DHCP, UPnP, NTP, QoS, ONVIF Profile S & G	
o.	Security	Password Protection, IP Address filtering, User Access Log, HTTPS encryption	
p.	Operating conditions	0 to 50°C (temperature), 50 to 90% (humidity)	
q.	Casing	NEMA 4X / IP-66, IK10 rated	
r.	Intelligent Video	Motion Detection & Tampering alert	

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#	Parameter	Minimum Specifications	Bidder Compliance(Yes/No)
s.	Alarm I/O	Minimum 2 Input & 1 Output contact for 3rd part interface	
t.	Certification	UL/EN, CE,FCC	
3	**On site-out station processing unit communication & Electrical Interface (Junction Box)**		
a.	Data Storage on site	The system should be equipped with appropriate storage capacity for 7 days 24X7 recording, with overwriting capability. The images should be stored in tamper proof format only.	
b.	Network Connectivity	Wired/GPRS based wireless technology with 3G upgradable to 4G capability.	
c.	Minimum 2(two) USB Port to support the latest external mass storage devices and Ethernet (10/100) Port for possible networking. However all logs of data transfer through the ports shall be maintained by the system.		
d.	The system should be capable of working in ambient temperature range of -5°C to 60°C.		
e.	Lightening arrester shall be installed for safety of system (As per BIS standard IS 2309 of 1989).		
f.	The housing(s) should be capable of withstanding vandalism and harsh weather conditions and should meet IP66, IK10 standards (certified).		
4	**Violation Transmission and Security**		
a.	Encrypted data, images and video pertaining to Violations at the Onsite processing station should be transmitted to the TCC electronically through GPRS based wireless technology with 3G upgradable to 4G, or wired connectivity if available in Jpeg format		
b.	Advanced Encryption Standard (AES) shall be followed for data encryption on site and TCC, and its access will protected by a password.		
c.	The vendor shall ensure that the data from the onsite processing unit shall be transferred to TCC within one day.		

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#	Parameter	Minimum Specifications	Bidder Compliance(Yes/No)
5	**Video Recording**		
a.	The system should be capable of continuous video recording in base station for 7 days. The system shall automatically overwrite the data after 7 days. It should be noted that at any point of time the local storage at the base station should have the data of previous 7 days.		
b.	Direct extraction through any physical device like USB flash drive , Portable Hard disk etc. shall be possible		

9.6. Speed Violation Detection System

#	Description		Bidder Compliance(Yes/No)
1.	The system should be capable of generating a video & minimum 3 snapshot in any of the standard industry formats (MJPEG, JPG, avi, mp4, mov, etc) with at least 10 frames per second. The video shall be from t-5 to t+5 sec of the violation and should also be recorded (being the instant at which the infraction occurred).		
2.	**Speed**		
a.	Unit of Speed Measurement	Kmph	
b.	Speed detection system to Capture speed	200Kmph ± 5%	
c.	Speed Threshold	(Vendor should provide manufacturer certificate/third party test report in support of their claim)	
d.	Speed Enforcement Technology	Radar/Laser/Others	
3.	**Digital Network Camera**		
a	Video Compression	H.264	
b	Video Resolution	1920 080	
c	Frame rate	Min. 60 fps	

#	Description		Bidder Compliance(Yes/No)
d	Image Sensor	1/3" Progressive Scan CCD / CMOS	
e	Lens Type	Varifocal, C/CS Mount, IR Correction full HD lens	
f	Lens#	Auto IRIS 5~50mm /8 – 40 mm, F1.4	
g	Minimum Illumination	Colour: 0.5 lux, B/W: 0.1 lux (at 30 IRE)	
h	IR Cut Filter	Automatically Removable IR-cut filter	
i	Day/Night Mode	Colour, Mono, Auto	
j	S/N Ratio	≥ 50 Db	
k	Auto adjustment + Remote Control of Image settings	Colour, brightness, sharpness, contrast, white balance, exposure control, backlight compensation, Gain Control, Ture Wide Dynamic Range	
l	Audio	Audio Capture Capability, G.711, G.726	
m	Local storage	Micro SDXC up to 64GB (Class 10) In the event of failure of connectivity to the central server the camera shall record video locally on the SD card automatically. After the connectivity is restored these recordings shall be automatically merged with the server recording such that no manual intervention is required to transfer the SD card based recordings to server.	

#	Description		Bidder Compliance(Yes/No)
n	Protocol	IPV4, IPV6, HTTP, HTTPS, FTP/SMTP, RTSP, RTP, TCP, UDP, RTCP, DHCP, UPnP, NTP, QoS, ONVIF Profile S & G	
o	Security	Password Protection, IP Address filtering, User Access Log, HTTPS encryption	
p	Operating conditions	0 to 50°C (temperature), 50 to 90% (humidity)	
q	Casing	NEMA 4X / IP-66, IK10 rated	
r	Intelligent Video	Motion Detection & Tampering alert	
s	Alarm I/O	Minimum 2 Input & 1 Output contact for 3rd part interface	
t	Certification	UL/EN, CE,FCC	
4.	**Recording & display information archive medium**		
a.	The system should be capable of recording the following details of the infracting vehicles		
b.	• Computer generated unique ID of each violation • Date (DD/MM/YYYY) • Time (HH:MM:SS) • Equipment ID • Location ID • Carriageway or direction of violating vehicle • In cases when multiple infracting vehicles are detected in one instant the system should be capable to provide the following data for all Infracting vehicles detected o Type of Violation o Notified speed limit (in Kmph) o Speed of violating vehicle (in Kmph) o Lane Number of violating vehicle o Registration Number of violating vehicle		

#	Description		Bidder Compliance(Yes/No)
5.	**On site-out station processing unit communication & Electrical Interface**		
a.	Data Storage on site	The system should be equipped with appropriate storage capacity for 7 days 24X7 recording, with overwriting capability. The images should be stored in tamper proof format only.	
b.	Network Connectivity	Wired/GPRS based wireless technology with 3G upgradable to 4G capability.	
c.	Minimum 2(two) USB Port to support the latest external mass storage devices and Ethernet (10/100) Port for possible networking. However all logs of data transfer through the ports shall be maintained by the system.		
d.	The system should be capable of working in ambient temperature range of -50 degreeC to 60 degree C		
e.	Atleast one hour UPS power back up to keep the system functional in case of power failure without any break in recording the violation.		
f.	Lightening arrester shall be installed for safety of system (As per BIS standard IS 2309 of 1989)		
g.	The housing(s) should be capable of withstanding vandalism and harsh weather conditions and should meet IP66, IK10 standards (certified).		
6.	**Violation Transmission and Security**		
a.	Encrypted data, images and video pertaining to Violations at the Onsite processing station should be transmitted to the TCC electronically through GPRS based wireless technology with 3G upgradable to 4G or wired connectivity, in Jpeg format.		

#	Description	Bidder Compliance(Yes/No)
b.	Advanced Encryption Standard (AES) shall be followed for data encryption on site and TCC, and its access will protected by a password.	
c.	The vendor shall ensure that the data from the onsite processing unit shall be transferred to TCC within one day.	
7.	**Video Recording**	
a.	The system should be capable of continuous video recording in base station for 7 days. The system shall automatically overwrite the data after 7 days. It should be noted that at any point of time the local storage at the base station should have the data of previous 7 days.	
b.	Direct extraction through any physical device like USB, Hard disk shall be possible	

9.7. Speed Control Signs

#	Parameter	Minimum Specifications	Bidder Compliance (Yes/No)
1.	The system shall use Light Emitting Diodes (LEDs)		
2.	Color	C2 as per IRC/EN12966 Standards	
3.	Contrast Ratio	R3 as per IRC/ EN12966 Standard	
4.	Viewing distance	atleast 300 meters	
5.	Display capability	Display Speed Symbols (Number) and Entryway prohibited symbol	
6.	Auto dimming	Auto dimming capability to adjust to ambient light level (sensor based automatic control)	
7.	Pixel pitch	12 mm	

#	Parameter	Minimum Specifications	Bidder Compliance (Yes/No)
8	Display Dimension	960mm x 960mm or similar	
9	Brightness	Auto dimming feature	
10	Housing Size	960mm x 960mm or similar	
11	Finish and Paint	Powder Coated.	
12	Wind load	As per IRC/ EN 12966	
13	Protection against dust ingress	P2 as per EN 60529	
14	Protection against water ingress	P2 as per EN 60529	
15	Input voltage	230 VAC	
16	Communication	Communication via IP network. Ethernet, GSM/GPRS,	
17	Communication Port	RJ45 Ethernet ,RS232,RS485	
18	MTBF / Life span	Minimum 10 Years or better	
19	Operating Temperature	0º C to 50º C or better	
20	Humidity	Operating ambient humidity: 95% or better	

9.8. Variable Message Sign Boards

#	Parameter	Minimum Specifications	Bidder Compliance (Yes/No)
1.	**Dimensions**		
a.	Minimum 3.0m length X 1.5m height X 0.2m depth. (3000mm x 1500mm X 200mm approx.)		
2.	**Colour LED**	Full Colour, class designation C2 as per IRC/EN 12966 standard	
3.	**Luminance Class/Ratio**	L3 as per IRC/EN 12966 standards.	
4.	**Luminance Control & auto Diming**		
a.	Should be automatically provide different luminance levels but shall also be controllable from the traffic centre using software.		
b.	Auto dimming capability to adjust to ambient light level (sensor based automatic control)		
c.	Photoelectric sensor shall be positioned at the sign front and sign rear to measure ambient light. Capable of being continually exposed to direct sunlight without impairment of performance.		
5.	**Contrast Ratio**	R3 as per IRC/EN 12966 standard	
6.	**Beam Width**	B6+ as per IRC/EN12966 standards.	
7.	**Pixel Pitch**	12 mm or better	
8.	**Picture Display**		
d.	At least 300mm as per IRC /EN 12966 standards		
e.	Full Matrix: Number of lines & characters adjustable, active area: 2.88mX1.2m at least.		
f.	Synchronized Dot to Dot display.		
a.	Capable of displaying real time message generated by Traffic Monitoring Centre (TCC).		
b.	Special frontal design to avoid reflection.		
c.	Display shall be UV resistant		

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#	Parameter	Minimum Specifications	Bidder Compliance (Yes/No)
9.	**Viewing Angle**	B6+ as per IRC/EN12966 standard- Viewing angle shall ensure message readability for motorists in all lanes of the approach road	
10.	**Viewing Distance**	Suitable for readability from 150 Mtrs. or more at the character size of 240mm, from moving vehicles.	
11.	**Self-Test**		
a.	VMS shall have self-test diagnostic feature to test for correct operation.		
b.	Display driver boards shall test the status of all display cells in the sign even when diodes are not illuminated.		
c.	All periodic self-test results shall be relayed to the TCC in real time to update the status of the VMS		
12.	**Alarms**		
a.	Door Open sensor to Inform Control room during unauthorized access		
b.	LED Pixel failure detection alarm		
13.	**Flicker**	Refresh Frequency should not be less 90 Hz. No visible flicker to naked eye.	
14.	**Multiple Data Communication interface/Port**	RJ45 Ethernet, RS232, RS 485, FC port and any other suitable	
15.	**Communication (connectivity)**	Wired & GPRS based wireless technology with 3G upgradable to 4G capability.	
16.	**Ambient Operating Temperature**	The system should be capable of working in ambient temperature range of 0°C to 55°C.	

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#	Parameter	Minimum Specifications	Bidder Compliance (Yes/No)
17.	Humidity (RH)	Operating ambient humidity: 10% - 95% Rh or better.	
18.	Protection against Pollution/dust/water	Complete VMS should be of IP 65 protection level from front and IP54 from side and rear. As per EN60529 or equivalent Standard.	
19.	Power		
a.	170-250V AC (more than 90% power factor) or DC as per equipment requirement.		
b.	Protection for overvoltage/ fluctuation/drop of the nominal voltage (50%) shall be incorporated.		
c.	The enclosure shall contain at least two 15 Amp VAC (industrial grade) outlet socket for maintenance purpose.		
20.	Power Back-up & its enclosure	UPS for one hour power back-up with auto switching facility. The enclosure of UPS and battery should be pole mountable with IP 65 protected housing and lockable.	
21.	Material for VMS frame	at least 2mm aluminum or Non-corrosive, water resistant or better. Frame of the VMS should be black & Powder coated.	
22.	Mounting, Installation and finishes		
a.	Mounting structure shall use minimum 6Mtrs. High Cylindrical GI Pole (Class B) or suitable structure with 5.5 mtr. Minimum vertical clearance under the VMS sign from the Road surface.		
b.	The mounting shall be capable of withstanding road side vibrations at site of installation.		
c.	It shall be provided with suitable walkway for maintenance access.		

#	Parameter	Minimum Specifications	Bidder Compliance (Yes/No)
d.	The side's interior and rear of enclosures shall be provided in maintenance free natural aluminium finish. All enclosure shall be flat and wipe clean.		
e.	Rugged locking mechanism should be provided for the onsite enclosures and cabinets.		
f .	For Structural safety, the successful bidder has to provide structural safety certificate from qualified structural engineers approved/ certified by Govt. Agency.		
23.	**Wind Load**	WL9 as per EN12966 to withstand high wind speeds and its own load.	
24.	**Cabling, connections and Labelling.**		
a.	All cable conductors shall be of ISI marked for quality and safety. It shall be of copper insulated, securely fastened, grouped, wherever possible, using tie warps approximately every 10-20 Cms or cable trays.		
b.	All connections shall be vibration-proof quick release connections except for power cables terminating in terminal blocks, which shall be screwed down.		
c.	All terminal block shall be made from self-extinguishing materials. Terminations shall be logically grouped by function and terminals carrying power shall be segregated from control signal terminals.		
d.	All cables shall be clearly labelled with indelible indication that can clearly be identified by maintenance personnel using "As built : drawings".		
e.	Lightening arrester shall be installed for safety on each VMS.		
f.	The successful bidder has to provide safety certificate from qualified Electrical engineers approved/certified by Govt. Agency.		
26.	**Local Storage in VMS**	Embedded VMS controller should be capable to store atleast 100 messages and symbols/pictograms to allow display to run in isolated mode on a predefined	

#	Parameter	Minimum Specifications	Bidder Compliance (Yes/No)
		structures/timings, in case of connectivity failure.	

9.9. Traffic Surveillance Cameras

#	Parameters	Minimum Specifications or better	Bidder Compliance (Yes/No)
1.	Video Compression	H.264	
2.	Video Resolution	1920 X 1080	
3.	Frame rate	Min. 25 fps	
4.	Image Sensor	1/3" OR ¼" Progressive Scan CCD / CMOS	
5.	Lens	Auto-focus, 4.3 - 129 mm (corresponding to 30x)	
6.	Minimum Illumination	Colour: 0.5 lux, B/W: 0.1 lux (at 30 IRE)	
7.	Day/Night Mode	Colour, Mono, Auto	
8.	S/N Ratio	$\geq$ 50Db	
9.	PTZ	Pan: 360° endless/continuous, 0.2 to 300°/s (auto), 0.2 to 100°/s (Manual) Tilt: 90°, 0.2 to 100°/s (Auto), 0.2 to 40°/s (Manual) 30x optical zoom and 10x digital zoom 64 preset positions Auto-Tracking Pre-set tour	
10.	Auto adjustment + Remote Control of Image settings	Colour, brightness, sharpness, contrast, white balance, exposure control, backlight compensation, Gain Control, Wide Dynamic Range	
11.	Protocol	HTTP, HTTPS, FTP/SMTP, NTP, RTSP, RTP, TCP, UDP, RTCP, DHCP, UPnP, QoS, IPV4, IPV6, ONVIF S & G	
12.	Security	Password Protection, IP Address filtering, User Access Log, HTTPS encryption	

#	Parameters	Minimum Specifications or better	Bidder Compliance (Yes/No)
13.	Operating conditions	0 to 50°C (temperature), 50-90% humidity	
14.	Casing	NEMA 4X / IP-66 rated	
15.	Certification	UL/EN,CE,FCC	
16.	Local storage	Minimum 64 GB Memory card in a Memory card slot	
17.	IR	Internal/External. IR range should be 100 mtr or better	

9.10. Fixed Box Cameras for Traffic Violation and ANPR system

#	Parameter	Minimum Specifications or better	Bidder Compliance (Yes/No)
1.	Video Compression	H.264	
2.	Video Resolution	1920 X 1080	
3.	Frame rate	Min. 30 fps	
4.	Image Sensor	1/3" Progressive Scan CCD / CMOS	
5.	Lens Type	Varifocal, C/CS Mount, IR Corrected Full HD	
6.	Lens#	Auto IRIS 5~50mm/ 8 – 40 mm, F1.4	
7.	Minimum Illumination	Colour: 0.5 lux, B/W: 0.1 lux (at 30 IRE)	
8.	IR Cut Filter	Automatically Removable IR-cut filter	
9.	Day/Night Mode	Colour, Mono, Auto	
10.	S/N Ratio	≥ 50 Db	
11.	Auto adjustment + Remote Control of Image settings	Colour, brightness, sharpness, contrast, white balance, exposure control, backlight compensation, Gain Control, Wide Dynamic Range	
12.	Audio	Audio Capture Capability (G.711, G.726)	

#	Parameter	Minimum Specifications or better	Bidder Compliance (Yes/No)
13.	Local storage	Micro SDXC up to 64GB (Class 10) In the event of failure of connectivity to the central server the camera shall record video locally on the SD card automatically. After the connectivity is restored these recordings shall be automatically merged with the server recording such that no manual intervention is required to transfer the SD card based recordings to server.	
14.	Protocol	IPV4, IPV6, HTTP, HTTPS, FTP/SMTP, NTP, RTSP, RTP, TCP, UDP, RTCP, DHCP, UPnP, QoS, ONVIF Profile S & G	
15.	Security	Password Protection, IP Address filtering, User Access Log, HTTPS encryption	
16.	Operating conditions	0 to 50°C (temperature), 50 to 90% (humidity)	
17.	Intelligent Video	Motion Detection & Tampering alert	
18.	Alarm I/O	Minimum 2 Input & 1 Output contact for 3rd part interface	
19.	Casing	NEMA 4X / IP-66 rated, IK10	
20.	Certification	UL/EN, CE,FCC	

About 31 of the camera feeds would be used for Traffic Video Analytics and violations while about 68 would be used for ANPR (Automatic Number Plate Recognition). Please note that the exact numbers may change depending upon the survey carried out by the successful bidder along with Police Dept. Bidders are required to provide necessary provisions in these cameras to support Analytics.

9.11. IR Illuminators

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

#	Parameter	Minimum Specifications	Bidder Compliance (Yes/No)
1.	Range	Min. 100 meters, with adjustable angle to cover the complete field of view at specified locations	
2.	Minimum Illumination	High sensitivity at Zero Lux	
3.	Power	Automatic on/off operation	
4.	Casing	NEMA 4X / IP-66 rated	
5.	Operating conditions	0° to 50°C	
6.	Certification	UL/EN/CE/FCC	

9.12. Fish Eye Camera

Fish Eye camera should be compatible with the Video Management Software proposed by the bidder which is common for Surveillance cameras & Traffic Violation cameras. The D-Wrap function of fish eye camera should also work on same Video Management Software

#	Parameters	Minimum specifications	Bidder Compliance (Yes, No)
1	Image Sensor	1/3.2" Progressive Scan CCD / CMOS	
2	Video Resolution	12 MP or Better	
3	Video Compression	H.264	
4	Frame rate	Minimum 10fps at 12 MP	
5	Multiple Streams	Minimum 2 individually configurable streams	
6	Lens Type	Varifocal/Fixed, IR Corrected Lens	
7	Lens	2.6mm or Better	
8	Minimum Illumination	Color: 0.5 lux, B/W: 0.01 lux (at 30 IRE)	
9	IR Illuminator	In Built/External IR illuminator of 30mtrs	

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#	Parameters	Minimum specifications	Bidder Compliance (Yes, No)
10	Day/Night Mode	Color, Mono, Auto	
11	Dynamic Range	True WDR up to 100dB	
12	S/N Ratio	≥ 50 Db	
13	Auto adjustment + Remote Control of Image settings	Color, brightness, sharpness, contrast, white balance, exposure control, backlight compensation, Auto Gain Control, Auto back focus	
14	Audio	Full duplex, line in and line out, G.711, G.726	
15	Local storage	Micro SDXC up to 64GB (Class 10) In the event of failure of connectivity to the central server the camera shall record video locally on the SD card automatically. After the connectivity is restored these recordings shall be automatically merged with the server recording such that no manual intervention is required to transfer the SD card based recordings to server.	
16	Protocol	IPV4, IPV6, HTTP, HTTPS, NTP, SMTP, FTP, RTSP, RTP, TCP, UDP, RTCP, DHCP, UPnP, QoS, ONVIF profile S	
17	Security	Password Protection, IP Address filtering, User Access Log, HTTPS encryption	
18	Intelligent Video	Motion Detection & Tampering alert	
19	Alarm I/O	Minimum 1 Input & Output contact for 3rd part interface	
20	Operating conditions	0 to 50°C (temperature), 10 to 90% (humidity)	

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#	Parameters	Minimum specifications	Bidder Compliance (Yes, No)
21	Power	802.3af PoE (Class 0)/ PoE+ (IEEE 802.3at, Class 4) and 12-48VDC/24AC	
22	Casing	NEMA 4X / IP-66 rated & IK10	
23	Certification	UL/EN, CE,FCC	

9.13. Emergency Call Box (ECB) System

1. A high quality digital transceiver, to be placed at certain traffic junctions determined by the Police Department (mostly at junction boxes / camera poles to avoid any additional investments)

2. Key is to make it easily accessible by public

3. The unit shall preferably have a Double button which when pressed, shall connect to the Traffic Command Center/Police Command Center/other locations over the existing network infrastructure setup for ITCS project.

4. These are to be placed only a select locations such as Police/Traffic islands or pedestals or within the vicinity of constant Police supervision or CCTV field of view to avoid misuse and vandalism of the call box.

#	Parameter	Minimum Specifications	Bidder Compliance (Yes/No)
1.	Construction	Cast Iron/Steel Foundation, Sturdy Body for equipment	
2.	Call Button	Watertight Push Button, Visual Feedback for button press	
3.	Speaker	To be used for Public Address System	
4.	Connectivity	GSM/PSTN/Ethernet as per solution offered	
5.	Sensors	For tempering/Vandalism	
6.	Battery	Internal Battery with different charging options (Solar/Mains)	

#	Parameter	Minimum Specifications	Bidder Compliance (Yes/No)
7.	Power	Automatic on/off operation	
8.	Casing	IP-55 rated for housing	
9.	Operating conditions	0° to 50°C	

9.14. Field Junction Box

#	Parameter	Minimum Specifications	Bidder Compliance (Yes/No)
1.	Size	Suitable size as per site requirements to house the field equipment	
2.	Cabinet Material	GI with powder coated	
3.	Material Thickness	Min 2 mm	
5.	Number of Locks	Two	
6.	Protection	IP 55, Junction Box design should ensure to keep the temperature within suitable operating range for equipment's and should also avoid intentional water splash and dust intake	
7	Mounting	On Camera Pole / Ground mounted on concrete base	
8.	Form Factor	Rack Mount/DIN Rail	
9.	Other Features	Rain Canopy, Cable entry with glands, proper earthing and Fans/any other accessories as required for operation of equipment's within junction box.	

9.15. Poles for Traffic Signals

#	Component	Minimum Specifications	Bidder Compliance (Yes/No)
	Pole	Dimension as per drawing attached	
1	Material	GI Class 'B' pipe	
	Paint	Pole painted with two coats of zinc chromate primer and two coats of golden	

#	Component	Minimum Specifications	Bidder Compliance (Yes/No)
2		yellow Asian apostolate paint or otherwise as required by architect and in addition bituminous painting for the bottom 1.5 m portion of pole.	
	Cables		
1	No's of core	7 and 14 core 1.5 sq. mm. 3 Core 2.5 sq. mm.	
2	Materials	PVC insulated and PVC sheathed armored cable with copper conductor of suitable size as specified in BOQ.	
3	Certification	ISI Marked	
4	Standards	Indian Electricity Act and Rules	
a	IS:1554	PVC insulated electric cables (heavy duty)	

Note: The pole drawing is provided in Annexure VII

9.16. Cables

#	Component	Minimum Specifications	Bidder Compliance (Yes/No)
	Cables		
1	No's of core	7 and 14 core 1.5 sq. mm. 3 Core 2.5 sq. mm.	
2	Materials	PVC insulated and PVC sheathed armored cable with copper conductor of suitable size as specified in BOQ.	
3	Certification	ISI Marked	
4	Standards	Indian Electricity Act and Rules	
a	IS:1554	PVC insulated electric cables (heavy duty)	

9.17. Poles for Camera

#	Parameter	Minimum Specifications	Bidder Compliance (Yes/No)
1.	Pole type	Hot Dip Galvanized after Fabrication with Silver coating of 86 micron as per IS:2629;	

#	Parameter	Minimum Specifications	Bidder Compliance (Yes/No)
		Fabrication in accordance with IS-2713 (1980)	
2.	Height	5-10 Meters (or higher), as-per-requirements for different types of cameras & Site conditions	
3.	Pole Diameter	Min. 10 cm diameter pole (bidder to choose larger diameter for higher height)	
4.	Cantilevers	Based on the location requirement suitable size cantilevers to be considered with the pole	
5.	Bottom base plate	Minimum base plate of size 30x30x1.5 cm	
6.	Mounting facilities	To mount RLVD Cameras, CCTV cameras, Traffic Signals, Pedestrian Signals, Switch, etc.	
7.	Pipes, Tubes	All wiring must be hidden, through tubes/pipes. No wires shall be visible from outside.	
8.	Foundation	Casting of Civil Foundation with foundation bolts, to ensure vibration free erection (basic aim is to ensure that video feed quality is not impacted due to winds in different climatic conditions). Expected foundation depth of min. 100cms. Please refer to earthing standards mentioned elsewhere in the document.	
9.	Protection	Lightning arrester shall be provided, to protect all field equipment mounted on pole.	

9.18. Edge Level Switch (at Traffic Junctions)

#	Parameter	Minimum Specifications	Bidders Compliance (Yes, No)
1	Type	Managed Outdoor Industrial grade switch	

#	Parameter	Minimum Specifications	Bidders Compliance (Yes, No)
2	Total Ports	• Minimum 4 10/100/TX PoE/PoE+, 2x SFP Ports (can have 4xSFP Ports in certain locations) • May require higher port density at some locations, depending upon site conditions • May require fiber ports (for devices or for uplinks) at some locations, depending upon site conditions/distances.	
3	PoE Standard	IEEE 802.3af/ IEEE 802.3at or better	
4	Protocols	• IPV4,IPV6 • Support 802.1Q VLAN • DHCP support • IGMP • SNMP Management • Should support Loop protection and Loop detection • Should support Ring protection • End point Authentication • Should support NTP	
5	Access Control	• Support port security • Support 802.1x (Port based network access control). • Support for MAC filtering	

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#	Parameter	Minimum Specifications	Bidders Compliance (Yes, No)
		• Support security group access control list	
6	PoE Power per port	Sufficient to operate the CCTV cameras/edge devices connected	
7	Enclosure Rating	IP 30 or equivalent Industrial Grade Rating(to be housed in Junction box)	
8	Operating Temperature	0 -50 C or better Industrial Grade Rating	
9	Multicast support	IGMP Snooping V1, V2, V3	
10	Management	Switch needs to have RS-232/USB/RJ45 console port for management via a console terminal or PC,Web GUI NTP, Syslog for log capturing SNMP V1,V2,V3	
11	Compliance	UL/EN/IEC or equivalent	

9.19.Layer 3 Gigabit Manageable Switch (To be used for DC/Aggregation Layer 3 Switch)

#	Parameter	Minimum Specifications	Bidders Compliance (Yes, No)
1	Ports	• 24 or 48 (as per requirements) 10/100/1000 Base-TX/FX ports and extra 2 or 4 nos of 10G Base SX/LX/LR ports as per network solution offered. • TX/FX Split as per field/site requirement • All ports can auto-negotiate between 10Mbps/ 100Mbps/ 1000Mbps, half-	

#	Parameter	Minimum Specifications	Bidders Compliance (Yes, No)
		duplex or full duplex and flow control for half-duplex ports.	
2	Switch type	Layer 3	
3	MAC	32k or more	
4	Backplane	Properly sized Switching fabric capacity (as per network configuration to meet performance requirements of wire speed switching for the connected devices)	
5	Port Features	Must support Port Mirroring, Port Trunking and 802.3ad LACP Link Aggregation port trunks	
6	Flow Control	Support IEEE 802.3x flow control for full-duplex mode ports.	
7	Protocols	• IPV4, IPv6 • Support 802.1D, 802.1S, 802.1w, Rate limiting • Support 802.1Q VLAN encapsulation, IGMP v1, v2 and v3 snooping • 802.1p Priority Queues, port mirroring, DiffServ • DHCP support • Support upto 1024 VLANs • Support IGMP Snooping and IGMP Querying • Support Multicasting • Should support Loop protection and Loop detection, • Should support Ring protection	
8	Access Control	• Support port security • Support 802.1x (Port based network access control). • Support for MAC filtering. • Should support TACACS+ and RADIUS authentication	

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#	Parameter	Minimum Specifications	Bidders Compliance (Yes, No)
9	VLAN	• Support 802.1Q Tagged VLAN and port based VLANs and Private VLAN • The switch must support dynamic VLAN Registration or equivalent • Dynamic Trunking protocol or equivalent	
10	Protocol and Traffic	• Network Time Protocol or equivalent Simple Network Time Protocol support • Switch should support traffic segmentation • Traffic classification should be based on user-definable application types: TOS, DSCP, Port based, TCP/UDP port number	
11	Management	• Switch needs to have console port for management via PC • Must have support SNMP v1,v2 and v3 • Should support 4 groups of RMON • Should have accessibility using Telnet, SSH, Console access, easier software upgrade through network using TFTP etc. Configuration management through CLI, GUI based software utility and using web interface	

9.20. Core Switch

#	Parameter	Minimum Specifications	Bidder Compliance (Yes, No)
1	Ports	• 24 or 48 (as per density required) 1G/ 10G Ethernet ports (as per internal connection requirements) • Can have FCoE ports if FCoE solution is offered • Extra 2 or higher Uplink ports (40GE)	

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#	Parameter	Minimum Specifications	Bidder Compliance (Yes, No)
		• All ports can auto-negotiate between all allowable speeds, half-duplex or full duplex and flow control for half-duplex ports.	
2	Switch type	Layer 3	
3	MAC	32k or more	
4	Backplane	Capable of providing wire-speed switching for fully populated switch	
5	Throughput	Required throughput to achieve non-blocking performance for switch when all ports are populated.	
6	Port Features	Must support Port Mirroring, Port Trunking and 802.3ad LACP Link Aggregation port trunks	
7	Flow Control	Support IEEE 802.3x flow control for full-duplex mode ports.	
8	Protocols	• IPV4, IPV6 • Support 802.1D, 802.1S, 802.1w, Rate limiting • Support 802.1X Security standards • Support 802.1Q VLAN encapsulation, IGMP v1, v2 and v3 snooping • 802.1p Priority Queues, port mirroring, DiffServ • DHCP support • Support up to 1024 VLANs • Support IGMP Snooping and IGMP Querying • Support Multicasting • Should support Loop protection and Loop detection,	
9	Access Control	• Support port security • Support 802.1x (Port based network access control). • Support for MAC filtering.	

#	Parameter	Minimum Specifications	Bidder Compliance (Yes, No)
		• Should support TACACS+ and RADIUS authentication	
10	VLAN	• Support 802.1Q Tagged VLAN and port based VLANs and Private VLAN • The switch must support dynamic VLAN Registration or equivalent • Dynamic Trunking protocol or equivalent	
11	Protocol and Traffic	• Network Time Protocol or equivalent Simple Network Time Protocol support • Switch should support traffic segmentation • Traffic classification should be based on user-definable application types: TOS, DSCP, Port based, TCP/UDP port number	
12	Management	• Switch needs to have a console port for management via a console terminal or PC • Must have support SNMP v1,v2 and v3 • Should support 4 groups of RMON • Should have accessibility using Telnet, SSH, Console access, easier software upgrade through network using TFTP etc. Configuration management through CLI, GUI based software utility and using web interface	
13	Resiliency	• Dual load-sharing power supplies • Redundant fans	

9.21. WAN / Internet Router

#	Item	Minimum Specifications	Bidder Compliance (Yes, No)
1	Multi-Services	Should deliver multiple IP services over a flexible combination of interfaces	
2	Ports	As per overall network architecture proposed by the bidder, the router should be populated with required number of LAN/WAN ports/modules, with cable for connectivity to other network elements.	
3	Interface modules	Must support up to 10G interfaces as per the design. Must have capability to connect with variety of interfaces.	
4	Protocol Support	• Must have support for TCP/IP, PPP, Frame relay and HDLC • Must support VPN • Must have support for integration of data and voice services • Routing protocols of RIP, OSPF, and BGP. • Support IPV4, IPV6 • Support load balancing	
5	Manageability	Must be SNMP manageable	
6	Traffic control	Traffic Control and Filtering features for flexible user control policies	
7	Bandwidth	Bandwidth on demand for cost effective connection performance enhancement	
8	Remote Access	Remote access features	
9	Redundancy	• Redundancy in terms of Power supply(s). Power supply should be able to support fully loaded chassis • All interface modules, power supplies should be hot-swappable	
10	Security features	• MD5 encryption for routing protocol • NAT ,URL based Filtering	

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#	Item	Minimum Specifications	Bidder Compliance (Yes, No)
		• RADIUS/AAA Authentication • Management Access policy • IPSec / Encryption • L2TP	
11	QOS Features	• RSVP • Priority Queuing • Policy based routing • Traffic shaping • Time-based QoS Policy • Bandwidth Reservation / Committed Information Rate	

9.22. Firewall

#	Item	Minimum Specifications	Bidder Compliance (Yes/No)
1.	Physical attributes	• Should be mountable on 19" Rack • Modular Design • Internal redundant power supply	
2.	Interfaces	• 4 x GE, upgradable to 8 GE • Console Port 1 number	
3.	Performance and Availability	• Encrypted throughput: minimum 1 Gbps • Concurrent connections: up to 100,000 • Simultaneous VPN tunnels: 2000	
4.	Routing Protocols	• Static Routes • RIPv1, RIPv2 • OSPF	
5.	Protocols	• TCP/IP • RTP • IPSec, DES/3DES/AES • FTP, HTTP, HTTPS,SNMP, SMTP • DHCP, DNS, Support for IP v4 & IPv6 • IPSEC	

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#	Item	Minimum Specifications	Bidder Compliance (Yes/No)
6.	Other support	• 802.1Q, NAT, PAT, IP Multicast support, Remote Access VPN, Time based Access control lists, URL Filtering, support VLAN, Radius/ TACACS, Support multilayer firewall protection, Traffic shaping, Bandwidth monitoring	
7.	QoS	• QoS features like traffic prioritisation, differentiated services, committed access rate. Should support for QoS features for defining the QoS policies.	
8.	Management	• Console, SSHv2, Browser based configuration • SNMPv1, SNMPv2, SNMPv3	
9.	Certifications	ICSA/NDPP	

9.23. Intrusion Prevention System

This can be offered as separate unit or as a module in firewall

#	Item	Required Specifications	Bidder Compliance (Yes, No)
1	Performance	Should have an aggregate throughput of no less than 500Mbps Total Simultaneous Sessions – 500,000	
2	Features	IPS should have Dual Power Supply IPS system should be transparent to network, not default gateway to Network IPS system should have Separate interface for secure management IPS system should be able to protect Multi Segment in the network, should be able to protect 4 segments.	
3	Real Time Protection	• Web Protection	

#	Item	Required Specifications	Bidder Compliance (Yes, No)
		• Mail Server Protection	
		• Cross Site Scripting	
		• SNMP Vulnerability	
		• Worms and Viruses	
		• Brute Force Protection	
		• SQL Injection	
		• Backdoor and Trojans	
4	Stateful Operation	• TCP Reassembly	
		• IP Defragmentation	
		• Bi-directional Inspection	
		• Forensic Data Collection	
		• Access Lists	
5	Signature Detection	Should have provision for Real Time Updates of Signatures, IPS Should support Automatic signature synchronization from database server on web Device should have capability to define User Defined Signatures	
6	Block attacks in real time	• Drop Attack Packets	
		• Reset Connections	
		• Packet Logging	
		• Action per Attack	

#	Item	Required Specifications	Bidder Compliance (Yes, No)
7	Alerts	• Alerting SNMP • Log File • Syslog • E-mail	
8	Management	• SNMP v1, v2, v3 • HTTP, HTTPS • SSHv2, Console	
9	Security Maintenance	• IPS Should support 24/7 Security Update Service • IPS Should support Real Time signature update • IPS Should support Provision to add static own attack signatures • System should show real-time and History reports of Bandwidth • IPS should have provision for external bypass Switch	

9.24. Servers (As Building block, to establishing computing solution for sub-systems/solutions)

Server for ITCS solutions such as Variable Messaging Sign (VMS) Server, Traffic Surveillance Cameras-Management Server, Traffic Surveillance Cameras-Recording Server, Analytics Server, ANPR Server, Traffic Analytics Server for Mid-Block VMS System, RLVD Server, Speed Detection Server, EMS Server, Mobile App Server, Database Server, ECB System Server, e-Challan Server etc., should have no single point of failover.

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#	Parameter	Minimum Specifications	Bidders Compliance (Yes, No)
1	Processor	Latest series/ generation of 64 bit x86 processor(s) with Ten or higher Cores Processor speed should be minimum 2.4 GHz Minimum 2 processors per each physical server	
2	RAM	Minimum 64 GB Memory per physical server	
3	Internal Storage	2 x 300 GB SAS (10k rpm) hot swap	
4	Network interface	2 X 20GbE LAN ports for providing Ethernet connectivity Optional: 1 X Dual-port 16Gbps FC HBA (or FCoE) for providing FC connectivity Note: If bidder is offering FCoE based solution, corresponding ports must be present in server as well as storage controllers.	
5	RAID support	As per requirement/solution	
6	Operating System	Licensed version of 64 bit latest version of Linux/ Unix/Microsoft® Windows based Operating system)	
7	Form Factor	Blade	
8	Virtualization	Shall support Industry standard virtualization hypervisor like Hyper-V, VMWARE, Oracle VM etc. OEM of the blade chassis and servers offered should in "Validated Configuration" list and certified by OEM to run virtualization.	

9.25. Blade Chassis Specifications

The blade chassis shall have the following minimum technical specifications:

#	Minimum Specifications	Bidders Compliance (Yes, No)
1	Minimum 6U size, rack-mountable, capable of accommodating minimum 8 or higher hot pluggable blades	

#	Minimum Specifications	Bidders Compliance (Yes, No)
2	Dual network connectivity of 10 G speed for each blade server for redundancy shall be provided	
3	Backplane shall be completely passive device. If it is active, dual backplane shall be provided for redundancy.	
4	Have the capability for installing industry standard flavours of Microsoft Windows, and Enterprise RedHat Linux OS	
5	Shall support Industry standard virtualization hypervisor like Hyper-V, VMWARE, Oracle VM etc. OEM of the blade chassis and servers offered should in "Validated Configuration" list and certified by OEM to run virtualization.	
6	DVD ROM shall be available in chassis, can be internal or external, which can be shared by all the blades allowing remote installation of software	
7	Minimum 1 USB port	
8	Two hot-plug/hot-swap, redundant 10 Gbps Ethernet or FCoE module with minimum 16 ports (cumulative), having Layer 2/3 functionality. If bidder is offering FCoE based solution, corresponding ports must be present in server as well as storage controller.	
9	Two hot-plugs/hot-swap redundant 16 Gbps Fiber Channel module for connectivity to the external Fiber channel Switch and ultimately to the storage device	
10	Power supplies shall have N+N. All power supplies modules shall be populated in the chassis. Required number of PDUs and power cables, to connect all blades, Chassis to Data Center power outlet.	
11	Hot pluggable/hot-swappable redundant cooling unit	
12	Provision of systems management and deployment tools to aid in blade server configuration and OS deployment	
13	Blade enclosure shall have provision to connect to display console/central console for local management such as troubleshooting, configuration, system status/health display.	
14	Single console for all blades in the enclosure, built-in KVM switch or Virtual KVM features over IP	

#	Minimum Specifications	Bidders Compliance (Yes, No)
15	Dedicated management network port shall have separate path for remote management.	

9.26. Storage

#	Parameter	Minimum Specifications	Bidders Compliance (Yes, No)
1	Solution/ Type	• IP Based/iSCSI/FC/NFS/CIFS • If bidder is offering FCoE based solution, corresponding ports must be present in server as well as storage controller.	
2	Storage	• Storage Capacity should be minimum 50 TB (usable, after configuring in offered RAID configuration) • RAID solution offered must protect against double disc failure. • Disks should be preferably minimum of 1.2 TB capacity for SAS and 3 TB for SATA (combination as per performance and SLA requirements of overall solution) • To store all types of data (Data, Voice, Images, Video, etc) • Proposed Storage System should be scalable (vertically/horizontally)	
3	Hardware Platform	• Rack mounted form-factor • Modular design to support controllers and disk drives expansion	
4	Controllers	• At least 2 Controllers in active/active mode • The controllers / Storage nodes should be upgradable seamlessly, without any disruptions / downtime to production workflow for performance, capacity enhancement and software / firmware upgrades.	

#	Parameter	Minimum Specifications	Bidders Compliance (Yes, No)
5	RAID support	• Should support various RAID Levels	
6	Cache	• Minimum 64 GB of useable cache across all controllers. If cache is provided in additional hardware for the storage solution, then cache must be over and above 64 GB.	
7	Redundancy and High Availability	• The Storage System should be able to protect the data against single point of failure with respect to hard disks, connectivity interfaces, fans and power supplies	
8	Management software	• All the necessary software (GUI Based) to configure and manage the storage space, RAID configuration, logical drives allocation, snapshots etc. are to be provided for the entire system proposed. • Licenses for the storage management software should include disc capacity/count of the complete solution and any additional disks to be plugged in in the future, upto max capacity of the existing controller/units. • A single command console for entire storage system. • Should also include storage performance monitoring and management software • Should provide the functionality of proactive monitoring of Disk drive and Storage system for all possible disk failures • Should be able to take "snapshots" of the stored data to another logical drive for backup purposes	

#	Parameter	Minimum Specifications	Bidders Compliance (Yes, No)
9	Data Protection	The storage array must have complete cache protection mechanism either by de-staging data to disk or providing complete cache data protection with battery backup for up to 4 hours	
Secondary Storage			
1	Solution/ Type	• Secondary Storage (Archival/Backup) can be on any media such as Disks, Disk systems, etc. or its combination along with all associate software. (so as to arrive at lower cost per TB) • **Minimum 285 TB** usable as secondary storage • May or may not use de-duplication technology • Compatible with primary storage	
2	Backup Size	To store data as required, to meet the archival requirement for different type of data/information • 23 days of storage for traffic surveillance camera feeds • 83 days of storage for traffic enforcement systems • 275 days of storage for ATCS systems	
3	Hardware Platform	• Rack mounted • Rack based Expansion shelves Must use latest stable technology platform, with support available for next 5 years.	
4	Software Platform	Must include backup/archive application portfolio required	
5	Retrieval Time	Retrieval time for any data stored on secondary storage should be max. 4 hours for critical data & 8 hours for other data. This would be taken into account for SLA	

#	Parameter	Minimum Specifications	Bidders Compliance (Yes, No)
		calculation. (Critical data means any data needing urgent attention by the Judicial System or by Police Dept. for investigation / terrorist treat perception).	

9.27. Monitoring Workstations

#	Parameter	Minimum Specifications	Bidder Compliance (Yes/No)
1.	Processor	Latest generation 64bit X86 Quad core processor(3Ghz) or better	
2.	Chipset	Latest series 64bit Chipset	
3.	Motherboard	OEM Motherboard	
4.	RAM	Minimum 8 GB DDR3 ECC Memory @ 1600 Mhz. Slots should be free for future upgrade. Minimum 4 DIMM slots, supporting up to 32GB ECC	
5.	Graphics card	Minimum Graphics card with 2 GB video memory (non- shared)	
6.	HDD	2 TB SATA-3 Hard drive @7200 rpm with Flash Cache of 64GB SSD. Provision for installing 4 more drives.	
7.	Media Drive	NO CD / DVD Drive	
8.	Network interface	10/100/1000 Mbps autosensing on board integrated RJ-45 Ethernet port.	
9.	Audio	Line/Mic IN, Line-out/Spr Out (3.5 mm)	
10.	Ports	Minimum 6 USB ports (out of that 2 in front)	

#	Parameter	Minimum Specifications	Bidder Compliance (Yes/No)
11.	Keyboard	104 keys minimum OEM keyboard	
12.	Mouse	2 button optical scroll mouse (USB)	
13.	PTZ joystick controller *(with 2 of the workstations in SCOC)*	• PTZ speed dome control for IP cameras • Minimum 10 programmable buttons • Multi-camera operations • Compatible with all the camera models offered in the solution • Compatible with VMS /Monitoring software offered	•
14.	Monitor	22" TFT LED monitor, Minimum 1920 x1080 resolution, 5 ms or better response time, TCO 05 (or higher) certified	
15.	Certification	Energy star 5.0/BEE star certified	
16.	Operating System	64 bit pre-loaded OS with recovery disc	
17.	Security	BIOS controlled electro-mechanical internal chassis lock for the system.	
18.	Antivirus feature	Advanced antivirus, antispyware, desktop firewall, intrusion prevention (comprising of a single, deployable agent) which can be managed by a central server. (Support, updates, patches and errata for the entire contract/ project period)	

#	Parameter	Minimum Specifications	Bidder Compliance (Yes/No)
19.	Power supply	SMPS; Minimum 400-watt Continuous Power Supply with Full ranging input and APFC. Power supply should be 90% efficient with EPEAT Gold certification for the system.	

9.28. Network Laser Color Printer

#	Parameter	Minimum Specifications	Bidder Compliance (Yes/No)
1	Print Speed	Black : 15 ppm or above on A3, 24 ppm or above on A4 Color : 8 ppm or above on A3, 12 ppm or above on A4	
2	Resolution	600 X 600 DPI	
3	Memory	Min. 8 MB or more	
4	Paper Size	A3, A4, Legal, Letter, Executive, custom sizes	
5	Paper Capacity	250 sheets or above on standard input tray, 100 Sheet or above on Output Tray	
6	Duty Cycle	25,000 sheets or better per month	
7	OS Support	Linux, Windows , 7, 8, 8.1, 10	
8	Interface	Ethernet Interface	

9.29. Display Screen

#	Parameter	Minimum Specifications	Bidders Compliance (Yes, No)
1	Technology	HD IPS LED Display , Direct LED Backlight	
2	Screen Size	viewing centers (minimum 42 inch diagonal)	

3	Resolution	Full high definition (Min 1920 x 1080) 16:9 Widescreen	
4	Contrast ratio	5000:1	
5	Brightness	350 nit	
6	Viewing angle	178 degree/178 degree (H/V)	
7	Response time	8ms	
8	Control	- RS232 control - On Screen Display (OSD) - IR remote control	
9	Operations	Standard	

9.30. KVM Module

#	Item	Minimum Specifications	Bidder Compliance (Yes/No)
1.	KVM Requirement	Keyboard, Video Display Unit and Mouse Unit (KVM) for the IT Infrastructure Management at Data Center	
2.	Form Factor	19" rack mountable	
3.	Ports	minimum 8 ports	
4.	Server Connections	It should support both USB and PS/2 connections.	
5.	Auto-Scan	It should be capable to auto scan servers	
6.	Rack Access	It should support local user port for rack access	
7.	SNMP	The KVM switch should be SNMP enabled. It should be operable from remote locations	

#	Item	Minimum Specifications	Bidder Compliance (Yes/No)
8.	OS Support	It should support multiple operating system	
9.	Power Supply	It should have dual power with failover and built-in surge protection	
10.	Multi-User support	It should support multi-user access and collaboration	

9.31.Server/Networking Rack Specifications

#	Parameter	Minimum Specifications	Bidder Compliance (Yes/No)
1.	Type	• 19" 42U racks mounted on the floor • Floor Standing Server Rack - 42U with Heavy Duty Extruded Aluminium Frame for rigidity. Top cover with FHU provision. Top & Bottom cover with cable entry gland plates. Heavy Duty Top and Bottom frame of MS. Two pairs of 19" mounting angles with 'U' marking. Depth support channels - 3 pairs with an overall weight carrying Capacity of 500Kgs. • All racks should have mounting hardware 2 Packs, Blanking Panel. • Stationery Shelf (2 sets per Rack) • All racks must be lockable on all sides with unique key for each rack • Racks should have Rear Cable Management channels, Roof and base cable access	
2.	Wire managers	Two vertical and four horizontal	

#	Parameter	Minimum Specifications	Bidder Compliance (Yes/No)
3.	Power Distribution Units	• 2 per rack • Power Distribution Unit - Vertically Mounted, 32AMPs with 25 Power Outputs. (20 Power outs of IEC 320 C13 Sockets & 5 Power outs of 5/15 Amp Sockets), Electronically controlled circuits for Surge & Spike protection, LED readout for the total current being drawn from the channel, 32AMPS MCB, 5 KV AC isolated input to Ground & Output to Ground	
4.	Doors	• The racks must have steel (solid / grill / mesh) front / rear doors and side panels. Racks should NOT have glass doors / panels. • Front and Back doors should be perforated with at least 63% or higher perforations. • Both the front and rear doors should be designed with quick release hinges allowing for quick and easy detachment without the use of tools.	
5.	Fans and Fan Tray	• Fan 90CFM 230V AC, 4" dia (4 Nos. per Rack) • Fan Housing Unit 4 Fan Position (Top Mounted) (1 no. per Rack) - Monitored - Thermostat based - The Fans should switch on based on the Temperature within the rack. The temperature setting should be factory settable. This unit should also include - humidity & temperature sensor	
6.	Metal	Aluminium extruded profile	

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#	Parameter	Minimum Specifications	Bidder Compliance (Yes/No)
7.	Side Panel	Detachable side panels (set of 2 per Rack)	

9.32. Online UPS for field locations

Minimum 1 hour power backup is required at each junction for all component under ITCS project.

#	Parameter	Minimum Specifications	Bidder Compliance (Yes/No)
1.	Capacity	Adequate capacity to cover all above IT Components at respective location	
2.	Technology	IGBT based PWM Technology, True Online UPS	
3.	Input Frequency Range	45 to 55 Hz	
4.	Output Frequency Range	45 to 55 Hz	
5.	Output Voltage	220VAC - 230VAC	
6.	Voltage Regulation	+/-2% (or better) and with built-in Over Voltage Cut off facility in the Device	
7.	Frequency	50 Hz +/- 0.1% (free Run Mode)	
8.	Harmonic Distortion (THD)	< 3% (linear load)	
9.	Output Waveform	Pure Sine wave	
10	Output Power Factor	0.8 or more	
11.	Battery Backup	Adequate and required battery backup to achieve required uptime of field	

#	Parameter	Minimum Specifications	Bidder Compliance (Yes/No)
		device as well as SLA of the overall solution..	
12.	Battery Type	Lead acid, Sealed Maintenance Free (SMF)	
13.	General Operating Temperature	0 to 40 Degree Celsius	
14.	Alarms & Indications	All necessary alarms & indications essential for performance monitoring of UPS like mains fail, low battery & fault detection	
15.	Bypass	Automatic, Manual Bypass Switch	
16.	Certifications	For Safety & EMC as per international standard	
17.	verall Protection	IP 55, Junction Box design should ensure to keep the temperature within suitable operating range for equipment's and should also avoid intentional water splash and dust intake	

9.33. Online UPS for indoor

#	Parameter	Minimum Specifications	Bidder Compliance (Yes/No)
1.	Capacity	Adequate capacity to cover all above IT Components at respective location	
2.	Output Wave Form	Pure Sine wave	
3.	Input Power Factor at Full Load	>0.90	
4.	Input	Three Phase 3 Wire for over 5 KVA	

#	Parameter	Minimum Specifications	Bidder Compliance (Yes/No)
5.	Input Voltage Range	305-475VAC at Full Load	
6.	Input Frequency	50Hz +/- 3 Hz	
7.	Output Voltage	400V AC, Three Phase for over 5 KVA UPS	
8.	Output Frequency	50Hz+/- 0.5% (Free running); +/- 3% (Sync. Mode)	
9.	Inverter efficiency	>90%	
10.	Over All AC-AC Efficiency	>85%	
11.	UPS shutdown	UPS should shutdown with an alarm and indication on following conditions 1)Output over voltage 2)Output under voltage 3)Battery low 4)Inverter overload 5)Over temperature 6)Output short	
12.	Battery Backup	60 minutes in full load	
13.	Battery	VRLA (Valve Regulated Lead Acid) SMF (Sealed Maintenance Free) Battery	
14.	Indicators & Metering	Indicators for AC Mains, Load on Battery, Fault, Load Level, Battery Low Warning, Inverter On, UPS on Bypass, Overload, etc. Metering for Input Voltage, Output Voltage and frequency, battery voltage, output current etc.	
15.	Audio Alarm	Battery low, Mains Failure, Over temperature, Inverter overload, Fault etc.	
16.	Cabinet	Rack / Tower type	
17.	Operating Temp	0 to 50 degrees centigrade	

#	Parameter	Minimum Specifications	Bidder Compliance (Yes/No)
18.	Management Protocol	SNMP Support through TCP/IP	

9.34. Structured Cabling Components

#	Parameter	Minimum Specifications	Bidder Compliance (Yes/No)
1.	Standards	ANSI TIA 568 C for all structured cabling components	
2.	OEM Warranty	OEM Certification and Warranty of 15-20 years as per OEM standards	
3.	Certification	UL Listed and Verified	

9.35. Electrical cabling component

#	Parameter	Minimum Specifications	Bidder Compliance (Yes/No)
1.	Standards	All electrical components shall be design manufactured and tested in accordance with relevant Indian standards IEC's	

9.36. Enterprise Management System (EMS)

To ensure that ICT systems are delivered at the performance level envisaged, it is important that an effective monitoring and management system be put in place. It is thus proposed that a proven Enterprise Management System (EMS) is proposed by the bidder for efficient management of the system, reporting, SLA monitoring and resolution of issues. Various key components of the EMS to be implemented as part of this engagement are –

1. Network Monitoring System
2. Server Monitoring System
3. Helpdesk System

The solution should provide a unified web based console which allows role based access to the users.

Network Management System

Solution should provide fault & performance management of the server side infrastructure and should monitor IP/SNMP enabled devices like Routers, Switches, PA System, Emergency Call Boxes, Sensors, etc (i.e. all devices supplied as part of RFP scope). Proposed Network Management shall also help monitor key KPI metrics like availability, in order to measure SLA's. Following are key functionalities that are required which will assist administrators to monitor network faults & performance degradations in order to reduce downtimes, increase availability and take proactive actions to remediate & restore network services.

#	Description	Bidder Compliance (Yes/No)
1	The proposed solution must automatically discover manageable elements connected to the infrastructure and map the connectivity between them. Solution should provide centralized monitoring console displaying network topology map.	
2	Proposed solution should provide customizable reporting interface to create custom reports for collected data	
3	The system must use advanced root-cause analysis techniques and policy-based condition correlation technology (at network level) for comprehensive analysis of infrastructure faults.	
4	The system should be able to clearly identify configuration changes and administrators should receive an alert in such cases.	
5	The solution should support multicast protocols too, if the overall project solution offered includes multicast.	

Server Performance Monitoring System

#	Description	Bidder Compliance (Yes/No)
1	The proposed tool should integrate with network performance management system and support operating system monitoring for various platforms supplied as part of this Project.	

#	Description	Bidder Compliance (Yes/No)
2	The proposed tool must provide information about availability and performance for target server nodes.	
3	The proposed tool should be able to monitor various operating system parameters such as processors, memory, files, processes, file systems, etc. where applicable.	
4	If the offered server/computing solution includes virtualisation, then the server performance monitoring solution must include virtualisation monitoring capabilities.	

Centralized Helpdesk System

#	Description	Bidder Compliance (Yes/No)
1	Helpdesk system should provide incident management, problem management templates along with helpdesk SLA system for tracking SLA's pertaining to incident resolution time for priority / non-priority incidents.	
2	System should also automatically create tickets based on alarm type	
3	The proposed helpdesk solution must provide flexibility of logging, viewing, updating and closing incident via web interface for issues related to the project.	
4	IT Asset database should be built and managed by the bidder, in order to carry out the scope of work items.	

9.37. Centralized Anti-virus Solution

The following features are required for centralized anti-virus solution, to protect all computing resources (servers, desktops, other edge level devices, etc.):

#	Description	Bidder Compliance (Yes/No)
1.	Ability to scan through all file types and various compression formats. Ability to scan for HTML, VBScript Viruses, malicious applets and ActiveX controls.	
2.	Must update itself over internet for virus definitions, program updates etc. (periodically as well as in push-updates in case of outbreaks)	
3.	Able to perform different scan Actions based on the virus type (Trojan/ Worm, Joke, Hoax, Virus, other)	
4.	Shall provide Real-time product Performance Monitor and Built-in Debug and Diagnostic tools, and context- sensitive help.	
5.	The solution must provide protection to multiple remote clients	
6.	Shall provide for virus notification options for Virus Outbreak Alert and other configurable Conditional Notification	
7.	Should be capable of providing multiple layers of defence	
8.	Shall have facility to clean, delete and quarantine the virus affected files.	
9.	Should support online update, where by most product updates and patches can be performed without bringing messaging server off-line.	
10.	Should support in-memory scanning so as to minimize Disk IO.	
11.	Should support Multi-threaded scanning	

#	Description	Bidder Compliance (Yes/No)
12.	Should support scanning of nested compressed files	
13.	Should support heuristic scanning to allow rule-based detection of unknown viruses	
14.	All binaries from the vendor that are downloaded and distributed must be signed and the signature verified during runtime for enhanced security.	
15.	Ability to scan through all file types and various compression formats. Ability to scan for HTML, VBScript Viruses, malicious applets and ActiveX controls.	
16.	Must update itself over internet for virus definitions, program updates etc. (periodically as well as in push-updates in case of outbreaks)	
17.	Able to perform different scan Actions based on the virus type (Trojan/ Worm, Joke, Hoax, Virus, other)	
18.	Shall provide Real-time product Performance Monitor and Built-in Debug and Diagnostic tools, and context- sensitive help.	
19.	The solution must provide protection to multiple remote clients	
20.	Shall provide for virus notification options for Virus Outbreak Alert and other configurable Conditional Notification.	
21.	Should be capable of providing multiple layers of defence	
22.	Shall have facility to clean, delete and quarantine the virus affected files.	

#	Description	Bidder Compliance (Yes/No)
23.	Should support online update, where by most product updates and patches can be performed without bringing messaging server off-line.	
24.	Should support in-memory scanning so as to minimize Disk IO.	
25.	Should support Multi-threaded scanning	
26.	Should support scanning of nested compressed files	
27.	Should support heuristic scanning to allow rule-based detection of unknown viruses	

9.38. Video Management System

Video management system shall constitute of a platform which will be designed for viewing, recording and replaying acquired video as part of overall project solution. This platform will be based on the Internet Protocol (IP) open platform concept. Major functionalities are described here:

VMS Overview

#	Description	Bidder Compliance (Yes/No)
1.	VMS shall be used for centralized management of all field camera devices, video servers and client users.	
2.	VMS server shall be deployed in a clustered server environment or support inbuilt mechanism for high availability and failover.	
3.	VMS shall support a flexible rule-based system driven by schedules and events.	
4.	VMS shall be supported for fully distributed solution for monitoring and control function, designed for limitless multi-site and multiple server installations requiring 24/7 surveillance with support for devices from different vendors.	
5.	VMS shall support ONVIF compliant internet protocol (IP) cameras.	

#	Description	Bidder Compliance (Yes/No)
6.	The bidder shall clearly list in their proposal the make and models that can be integrated with the VMS, additionally all the offered VMS and cameras must have Open Network Video Interface Forum (ONVIF) compliance. VMS shall be enabled for any standard storage technologies and video wall system integration.	
7.	VMS shall be enabled for integration with any external Video Analytics Systems both server & edge based.	
8.	VMS shall be capable of being deployed in a virtualized server environment without loss of any functionality.	
9.	All CCTV cameras locations shall be overlaid in graphical map in the VMS Graphical User Interface (GUI). The cameras selection for viewing shall be possible via clicking on the camera location on the graphical map. The graphical map shall be of high resolution enabling operator to zoom-in for specific location while selecting a camera for viewing.	
10.	VMS shall have an administrator interface to set system parameters, manage codecs, manage permissions and manage storage.	
11.	VMS day to day control of cameras and monitoring on client workstations shall be controlled through the administrator interface.	
12.	Whilst live control and monitoring is the primary activity of the monitoring workstations, video replay shall also be accommodated on the GUI for general review and also for pre- and post-alarm recording display.	
13.	The solution design for the VMS shall provide flexible video signal compression, display, storage and retrieval.	
14.	All CCTV camera video signal inputs to the system shall be provided to various command control center(s), viewing center etc., and the transmission medium used shall best suit the relative camera deployments and access to the CCTV Network.	

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#	Description	Bidder Compliance (Yes/No)
15.	VMS client shall have the capability to work with touch enabled multi-monitor workstations. It shall be capable of displaying videos in up to three (3) monitors simultaneously.	
a.	AVI files	
b.	Motion- Joint Photographic Experts Group (M-JPEG)	
c.	Moving Picture Expert Group-4 (MPEG-4)	
d.	MP4 Export or Latest	
16.	All streams to the above locations shall be available in real-time and at full resolution. Resolution and other related parameters shall be configurable by the administrator in order to provide for network constraints.	
17.	The VMS shall support field sensor settings. Each channel configured in the VMS shall have an individual setup for the following settings, the specific settings shall be determined according to the encoding device:	
18.	The VMS shall support the following operations:	
a.	Adding an IP device	
b.	Updating an IP device	
c.	Updating basic device parameters	
d.	Adding/removing channels	
e.	Adding/removing output signals	
f.	Updating an IP channel	
g.	Removing an IP device	
h.	Enabling/disabling an IP channel	
i.	Refreshing an IP device (in case of firmware upgrade)	
j.	Multicast at multiple aggregation points	

#	Description	Bidder Compliance (Yes/No)
19.	The VMS shall support retrieving data from edge storage. Thus when a lost or broken connection is restored, it shall be possible to retrieve the video from SD card and store it on central storage. System should support to view the recordings available over cameras local storage device (such as an SD card), and copy them to the server.	
20.	The VMS shall support bookmarking the videos. Thus, allowing the users to mark incidents on live and/or playback video streams.	
21.	The VMS shall allow the administrator to distribute camera load across multiple recorders and be able shift the cameras from one recorder to another by simple drag and drop facility.	
22.	VMS shall support automatic failover for recording.	
23.	VMS should also support dual recording or mirroring if required.	
24.	VMS shall support manual failover for maintenance purpose.	
25.	VMS shall support access and view of cameras and views on a smartphone or a tablet (a mobile device).	
26.	VMS shall support integration with the ANPR application.	
27.	VMS shall support integration with other online and offline video analytic applications.	
28.	VMS shall be able to accept alerts from video analytics built into the cameras, other third party systems, sensors etc.	

Client System

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

#	Functionality	Bidder Compliance (Yes/No)
1.	Viewing live video from cameras on the surveillance system.	

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

Remote Web Client

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

Mobile Client

#	Description	Bidder Compliance (Yes/No)
1.	The bidder shall be required to provide a standardised Mobile Application to integrate smart phones and tablets for 2-way	

	communication with the Video Management System in a secure manner. It will be responsibility of SI to configure such tablets / Smartphone with the Surveillance System and ensure that all the necessary access is given to these mobile users.	
2.	Communication with mobile client and server shall be encrypted with Digital Certificate.	

Matrix Monitor

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

Alarm Management Module

#	Description	Bidder Compliance (Yes/No)
1.	The alarm management module shall allow for continuous monitoring of the operational status and event-triggered alarms from various system servers, cameras and other devices. The alarm management module shall provide a real-time overview of alarm status or technical problems while allowing for immediate visual verification and troubleshooting.	
2.	The alarm management module shall provide interface and navigational tools through the client including;	
3.	Graphical overview of the operational status and alarms from servers, network cameras and external devices including motion detectors and access control systems.	

#	Description	Bidder Compliance (Yes/No)
4.	Intuitive navigation using a map-based, hierarchical structure with hyperlinks to other maps, servers and devices or through a tree-view format.	
5.	The module shall include flexible access rights and allow each user to be assigned several roles where each shall define access rights to cameras.	
6.	Basic VMS should be capable to accept third party generated events / triggers.	

Management / Integration Functionality

#	Description	Bidder Compliance (Yes/No)
1.	The Surveillance System shall offer centralised management of all devices, servers and users.	
2.	The Surveillance System should not have any limit on the number of cameras to be connected for Surveillance, Monitoring and Recording. Any increase in the no. of cameras should be possible by augmentation of Hardware components.	
3.	The Surveillance System shall support distributed viewing of any camera in the system using Video walls or big screen displays.	
4.	The Surveillance System shall support alarm management. The alarm management shall allow for the continuous monitoring of the operational status and event-triggered alarms from system servers, cameras and other external devices.	
5.	It should be possible to integrate the Surveillance System with 3rd-party software, to enable the users to develop customized applications for enhancing the use of video surveillance solution. For e.g., integrating alarm management to initiate SMS, E-Mail, VoIP call, etc.	

#	Description	Bidder Compliance (Yes/No)
6.	The Management system shall store the overall network elements configuration in central database, either on the management server computer or on a separate DB Server on the network.	
7.	System should be able to be integrated with Event Management / Incident Management System.	

System Administration Functionality

#	Description	Bidder Compliance (Yes/No)
1.	The System Administration Server shall provide a feature-rich administration client for system configuration and day-to-day administration of the system.	
2.	The System Administration Server shall support different logs related to the Management Server. • The System Log • The Audit Log • The Alert Log • The Event Log	
3.	Rules: The system shall support the use of rules to determine when specific actions occur. Rules shall define what actions shall be carried out under specific conditions. The system shall support rule initiated actions such as: • Start and stop recording • Set non-default live frame rate • Send notifications via email • Pop-up video on designated Client Monitor recipients	

Other Miscellaneous Requirements

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

Major Server components for VMS

Video Management Server(s)	Video Management System Servers will maintain coherent operations between all servers and workstations. It will host Control Center, where the system is administered, and System database. It will monitor one or more Recorder servers on separate dedicated computers, storage devices, IP-compatible devices, and one or more workstation. All network communication will also be is performed via the Video Management servers.
Video Recording Server(s)	The Video Recorder Server will be a dedicated server that will store and processes video with the help of Video Management System

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Video Analytics Server (s)	Video Analytics Software will be installed in the Video Analytics Server, Video Analytics is a software product that will analyse live video in real-time to detect, identify, and track objects of interest. It will automatically issue alerts to the appropriate personnel and initiate appropriate follow-up action according to pre-defined rules. This software will also manage sensors; each sensor will monitor a single video feed for security events. The video feeds will be connected over the network to the Video Analytics Server. Sensors on the Video Analytics Server will perform all event detection functions.
Web Server(s)	It will be used to launch the client application remotely through web browsers.
Gateway Server (s) – If required	A Media Gateway server will be used to establish remote connections to review and transcode the video. Standalone Media Gateway servers can also be installed on separate machines. Standalone servers will be recommended for such large systems that will transfer video data to remote clients.

9.39. ANPR System

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

#	Description	Bidder Compliance (Yes/No)
1.	**Vehicle Detection by Color** • The system shall detect the color of all vehicles in the camera view during daytime and label them as per the predefined list of configured system colors. The system will store the color information of each vehicle along with the license plate information for each transaction in the database. • The system shall have options to search historical records for post event analysis by the vehicle color or the vehicle color with license plate and date time combinations	
2.	**Alert Generation** • The system should have option to input certain license plates according to the hot listed categories like	

#	Description	Bidder Compliance (Yes/No)
	"Wanted", "Suspicious", "Stolen", etc by authorized personnel. • The system should be able to generate automatic alarms to alert the control room personnel for further action, in the event of detection of any vehicle falling in the hot listed categories.	
3.	**Vehicle Status Alarm Module** • On successful recognition of the number plate, system should be able generate automatic alarm to alert the control room for vehicles which have been marked as "Wanted", "Suspicious", "Stolen", "Expired". (System should have provision/expansion option to add more categories for future need). • The Instantaneous and automatic generation of alarms. In case of identity of vehicle in any category which is define by user.	
4.	**Vehicle Log Module** • The system shall enable easy and quick retrieval of snapshots, video and other data for post incident analysis and investigations. • The system should be able to generate suitable MIS reports that will provide meaningful data to concerned authorities and facilitate optimum utilization of resources. These reports shall include. o Report of vehicle flow at each of the installed locations for Last Day, Last Week and Last Month. o Report of vehicles in the detected categories at each of the installed locations for Last Day, Last Week and Last Month. o Report of Vehicle Status change in different Vehicle Categories. • The system shall have Search option to tune the reports based on license plate number, date and time, site location as per the need of the authorities. • The system shall have option to save custom reports for subsequent use. The system shall have option to export	

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#	Description	Bidder Compliance (Yes/No)
	report being viewed to common format for use outside of the ANPRS or exporting into other systems. • The system should provide advanced and smart searching facility of License plates from the database. There should be an option of searching number plates almost matching with the specific number entered (up to 1 and 2 character distance)	
5.	**Vehicle Category Editor** • The system should have option to input certain license plates according to category like "Wanted", "Suspicious", "Stolen", "Expired" etc. by Authorized personnel. • The system should have an option to add new category by authorized personnel. • The system should have option to update vehicle status in specific category by authorized personnel. e.g. on retrieval of stolen vehicle, system entry should be changed from "Stolen" to "Retrieved". • System should have option to specify maximum time to retain vehicle records in specific categories.	
6.	**Central Management Module** • The Central Management Module shall run on the ANPRS Central Server in control booth. It should be possible to view records and edit hotlists from the Central Server. **ANPR Specification** • Base Specification of Fixed Box Cameras (Annexure III) must be part of the ANPR specifications. **Camera Housing** • IP66 standard with sunshield vandal proof Housing	
7.	**Systems requirement** • **Local Server at Intersection:** The system must run on a Commercial Off the Shelf Server (COTS). Outdoor IP 66 Quad core processor based server should be able to cover at least 8 lanes. Temperature rating of the server should be at least 60 degree.	

#	Description	Bidder Compliance (Yes/No)
	• **Operating system:** The system must be based on open platform and should run on Linux or windows Operating system. • **Workstation:** Workstation must run on latest available OS.	

9.40. E Challan Handheld device

#	Component	Minimum Specifications	Bidder Compliance (Yes/No)
1	**Core Board**		
a	Operating System	Latest Windows, Linux or Android OS	
b	Processor	Min 800 MHz	
c	Memory (Flash ROM)	Minimum 512 MB	
d	RAM	256 MB Min	
e	Extend Slot	Micro SD 32 GB	
2	**Motherboard**		
a	Display	Minimum 3.5 inch TFT LCD (Trans reflective screen VGA/QVGA)	
b	Touch Screen	Yes	
c	Form Factor	Any	
d	GPS	GPS and A GPS	
e	Bluetooth	Yes	
f	Wifi	WiFi (802.11 b/g/n)	
g	Thermal Printer	Direct thermal line printing 3 inch	
h	Barcode scanner	1D and 2 Scanner	
i	External Interface	USB HOST/RS232(Customized)	
j	Protection class	IP 54	
k	Drop resistance level	1.5m	
3	**Camera**		
a	Camera	3 MP Min	
b	Camera- Video	Support still image and video capture	
4	**Keypad**		
a	Front	QWERTY 42 Keys function key can be soft key	
5	**Interface**		

#	Component	Minimum Specifications	Bidder Compliance (Yes/No)
a	Mini-USB Connector	USB2.0 connection	
b	SIM card slot	Yes	
c	TF card slot	Yes	
d	power jack	Yes	
e	Audio Jack	Yes	
6	**General**		
a	Battery Type	rechargeable Li-ion battery 3000mAh	
b	Operating temperature	0°C--50°C	
c	Storage temperature	0°C -- 50°C	
d	Operating humidity	10%--80%	
e	Storage humidity	10%--90%	
f	Payment PINPAD	The device should have lPCI , EMV certified PINPAD as per RBI guideline for accepting payment through Credit / Debit card	
g	Enclosure	Rugged	

9.41. Existing Traffic Signal Lamp Head / Aspects

SI are required to upgrade around 27 signals which are on fixed timer based to ATCS. For these signals the existing Aspects are to be utilized. The specifications are as below:

Sr. No	Component	Specifications	Bidder Compliance (Yes/No)
1	Input Voltage	230 V AC	
2	Operating Voltage	170V ~265 V AC	
3	Temperature range	- 0°C to + 50°C	
4	Light Intensity	400 Cd (minimum)	
5	Ingress Protection	IP65	
6	Phantom Class	Class 5	

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7	Power Consumption	Red - 10 W ±2 Watts Yellow - 7 W ± 2 Watts Green -7 W ± 2 Watts	
8	Special sign	300 mm of Arrow, Stop Man & Walk man	
9	LED Warranty	5 Years	
10	Dimension	300mm	
11	Standard	EN12368	
12	Aspect Enclosure	rust and rain proof made of Polycarbonate material	

9.42. Existing Infrastructure for Data Center

As mentioned in previous section, there is Data center set up at Surat by exiting vendor. SSCDL intends to utilize these exiting Data Center infrastructure for the proposed ITCS. SI may consider to upgrade / use these exiting infrastructure while designing their solution.

Sr. No	Component	
	System Description	Make/Model
1	COMMUNICATION/APPLICATION/DATABASE SERVER (1+1); for reliable, failsafe, 24X7X365 operations. TraMM Application Server =1, CoSiCoSt Database se=1, Disaster Recovery Centre (DRC) Server =1, to be bilJed as qty =1 (lot)	Make:IBM, Model: IBM 3550 M4
2	INHOUSE CABLE NETWORK	
3	POWER BACKUP UNIT	Make : Emerson , Model :GXT MT + 10KVA ,Sr.I 8392L1405100076 , 8392L1405100077
4	OPERATOR WORK STATION WITH COMPUTER SYSTEM; 8 Nos. for ATCS Operations Centre, 1 No. for Training Hall, 1 No. for NOC.	Make :Lenovo, Model: Thinkcentre M73
5	A3 COLOUR LASER PRINTER FOR USAGES INSIDE OF CONTROL ROOM; 1 No	Color LESER jet enterprise M552,S/N:CNBXH5V1GZ

Sr. No	Component	
6	SOFTWARE; System / communication / application software of complete hardware in TCC-CCR.	ATCS Software - CDAC Cosicost & Tra MM
10	Video wall of 3 X 3 matrix using 60" thin bezel LED/LCD works	Make: Delta, Model: LW5588SRIA
11	Data centre components including PAC, fire retardant, rodent retardant, raised flooring and access control system.	
a	Precision Air Conditioner (PAC)	
b	FM 200	Make: Emerson, Model: NOVAC
c	Rodent Repellent	Make: MASER, Model: VHFO, S/N:19852
d	Water Leakage Detection	Make: Emerson
e	Integration of Fire Alarm System VESDA, FM 200, Access Control & all other systems	Make: GST, Model:GST200/2/1, sr. no: 10103109
f	Integration of Access Control System VESDA, FM 200, Fire Detection & all other systems	Make: honeywell
g	Early Smoke	Make: vesda, Model: VEFVLF5002
h	Tap Library	Make: IBM, Model: TS3200
i	SAN Storage	Make: IBM, Model: V3700
j	Backup Software	Symantec

9.43. Existing System detail for "Safe City Project"

#	Description	Make	Model	Qty.
1	Fixed Camera	Verint	S5120	577
2	PTZ Camera	Verint	V5620	27
3	Fixed Camera	Kritikal		10
4	Video Management System	Verint	Nextiva	
5	Video wall	Delta	6778R8	18
6	Online UPS	Emerson	7400M (60KVA)	2
7	Server	Lenovo	HS22	20
8	Storage	IBM	DS 3500	1260TB

9.44. Existing E-Challan software platform detail

#	E Challan Software Platform	Platform
1	E Challan Application	Developed in PHP 5.6, MySQL Server 5.6
2	Mobile Application	Android 4.1 and above
3	Web services	PHP

9.45. Existing Intersection Traffic Signal Controller

Existing ATCS Application: CDAC Cosicost & Tra MM. The proposed ATCS system by the bidder shall be compatible & integrated with the existing application. SDK/API/All Communication & Program protocol related to hardware & software of the existing ATCS System shall be provided to the selected bidder by the SSCDL without any additional cost.

9.45.1. Technical Specification for Intersection Controller (Wireless) installed at BRTC Corridors (CDAC/WiTraC)

#	Specifications
1	**General features**
a	32 bit Microcontroller based
b	Pole Mountable master & Slave controllers
c	Distributed architecture (1 master & 16 slave controllers)
d	Signal switching and feedback on wireless medium
e	Use unlicensed 2.4 GHz or 5.8GHz Band
f	GPS Enabled Real-time Clock (RTC)
g	Inbuilt GPS Module for Time synchronization
h	RTC with internal battery
i	Inbuilt 20X4 LED backlit LCD and 5X4 keypad interface
j	16 optically isolated solid state lamp driving output for master & slave
k	16 optically isolated Vehicle Detector inputs for master & 4 input for slave
l	PWM based programmable intensity control for signal lamps
m	Lamp monitoring for Green-Green Conflict, Open Circuit and Short Circuit
n	Error logs on Flash Memory
o	Communication Interfaces
p	12 VDC Operated – Solar Power Compatible
2	**Modes of Operation**
a	Pre-timed
b	Vehicle Actuated

#	Specifications
c	Semi-Actuated
d	ATCS
e	Combination Pre-Timed, Vehicle Actuated, Semi Actuated & ATCS modes in any order
f	Manual
g	Hurry Call
h	Forced Flash
3	**Extended Modes of Operation**
a	Cable Less Synchronization (Pre-Timed, Vehicle Actuated, Semi Actuated)
b	Remote Administration (Hurry Call, Forced Flash, Junction Off, RTC, Signal Time update)
c	Wireless Police Panel
4	**Signal Plans**
a	32 – Phases
b	32 – Stages
c	24 - Cycle Plans
d	20 - Day Plans
e	4 – Week Plans
f	20 – Special Day Plans
g	4 – Hurry Calls
h	Programmable All Red
i	Programmable Conflict Plan
j	Programmable Start Amber
k	Programmable Red Extension
5	**Communication Interface**
a	Ethernet
b	Wireless ISM Band
c	USB
d	CAN
e	RS232
f	8 Auxiliary I/O interface
6	**Vehicle Detector/Sensor**
a	Camera based logic unit

9.45.2. Intersection Controller installed at NON-BRTC junctions (CMS/UCON)

#	Parameter	Specifications
1	Processor	Microcontroller Based
2	No. of signal group	16 signal groups with each programmable as either vehicular or pedestrian group.
3	Group sequence	ular: Green – Amber – Red trian: Green – Red Flash – Red Green – Green Flash – Red
4	No. of Phases	16
5	No of Signal Plans	16 Fixed Time/Cable Less Plans Flash Plan
6	No. of weekdays Plans	• 4 Auxiliary Signal Plans • 7 Weekday • 4 Auxiliary weekday
7	No. of signal plan switching in each weekday plan	32
8	Time Resolution	0.1 Seconds
9	Pedestrian wait outputs	16
10	Pedestrian Inputs	16
11	Modes & Operations	• Manual-Step or Manual- Stage • Select Fixed time • Hurry Call • UTC – Links • Flash • Lamps – Off All Red • Maintenance Mode
12	In each phase, following features can be programmed:	Late Start Green / Early cut off Green / Late cut off green

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#	Parameter	Specifications
13	Programmable Timings	
a	Cycle Time	0 ~ 255 Sec
b	Startup Flash	1 ~ 10 Sec
c	Startup Red	1 ~ 10 Sec
d	Minimum Amber Time	1 ~ 10 Sec
e	Minimum Green Time	1 ~ 30 Sec
f	Minimum All Red Time	1 ~ 10 Sec
g	Ped – Walk Time	1 ~ 99 Sec
h	Ped – Flash Time	1 ~ 30 Sec
i	Maximum Green	5 ~ 255 Sec
j	Gap, headway & Waste time	1 ~ 10 Sec

10. Annexure IV: Non-IT Requirements Specifications

The selected bidder should adhere to the specifications given below for Non-IT components. It is essential that Fire Proof material be used as far as possible and Certification from Fire Department be taken for Command Centres before Go-Live.

10.1. PVC Conduit

#	Description	Bidder Compliance (Yes/No)
1.	The conduits for all systems shall be high impact rigid PVC heavy-duty type and shall comply with I.E.E regulations for non-metallic conduit 1.6 mm thick as per IS 9537/1983.	
2.	All sections of conduit and relevant boxes shall be properly cleaned and glued using appropriate epoxy resin glue and the proper connecting pieces, like conduit fittings such as Mild Steel and should be so installed that they can remain accessible for existing cable or the installing of the additional cables.	
3.	No conduit less than 20mm external diameter shall be used. Conduit runs shall be so arranged that the cables connected to separate main circuits shall be enclosed in separate conduits, and that all lead and return wire of each circuit shall be run to the same circuit.	
4.	All conduits shall be smooth in bore, true in size and all ends where conduits are cut shall be carefully made true and all sharp edges trimmed. All joints between lengths of conduit or between conduit and fittings boxes shall be pushed firmly together and glued properly.	
5.	Cables shall not be drawn into conduits until the conduit system is erected, firmly fixed and cleaned out. Not more than two right angle bends or the equivalent shall be permitted between draw and junction boxes. Bending radius shall comply with I.E.E regulations for PVC pipes.	
6.	Conduit concealed in the ceiling slab shall run parallel to walls and beams and conduit concealed in the walls shall run vertical or horizontal.	
7.	The chase in the wall required in the recessed conduit system shall be neatly made and shall be of angle dimensions to permit the conduit to be fixed in the manner desired. Conduit	

#	Description	Bidder Compliance (Yes/No)
	in chase shall be hold by steel hooks of approved design of 60cm center the chases shall be filled up neatly after erection of conduit and brought to the original finish of the wall with cement concrete mixture 1:3:6 using 6mm thick stone aggregate and course sand.	

10.2. Wiring

#	Description	Bidder Compliance (Yes/No)
1.	PVC insulated copper conductor cable shall be used for sub circuit runs from the distribution boards to the points and shall be pulled into conduits. They shall be stranded copper conductors with thermoplastic insulation of 650 / 1100 volts grade. Colour code for wiring shall be followed.	
2.	Looping system of wring shall be used, wires shall not be jointed. No reduction of strands is permitted at terminations.	
3.	Wherever wiring is run through trunking or raceways, the wires emerging from individual distributions shall be bunched together with cable straps at required regular intervals. Identification ferrules indication the circuit and D.B. number shall be used for sub main, sub circuit wiring the ferrules shall be provided at both end of each sub main and sub-circuit.	
4.	Where, single phase circuits are supplied from a three phase and a neutral distribution board, no conduit shall contain wiring fed from more than one phase in any one room in the premises, where all or part of the electrical load consists of lights, fans and/or other single phase current consuming devices, all shall be connected to the same phase of the supply.	
5.	Circuits fed from distinct sources of supply or from different distribution boards or M.C.B.s shall not be bunched in one conduit. In large areas and other situations where the load is divided between two or three phases, no two single-phase switches connected to difference phase shall be mounted within two meters of each other.	

#	Description	Bidder Compliance (Yes/No)
6.	All splicing shall be done by means of terminal blocks or connectors and no twisting connection between conductors shall be allowed.	
7.	Metal clad sockets shall be of die cast non-corroding zinc alloy and deeply recessed contact tubes. Visible scraping type earth terminal shall be provided. Socket shall have push on protective cap.	
8.	All power sockets shall be piano type with associate's switch of same capacity. Switch and socket shall be enclosed in a M. S. sheet steel enclosure with the operating knob projecting. Entire assembly shall be suitable for wall mounting with Bakelite be connected on the live wire and neutrals of each circuit shall be continuous everywhere having no fuse or switch installed in the line excepting at the main panels and boards. Each power plug shall be connected to each separate and individual circuit unless specified otherwise. The power wiring shall be kept separate and distinct from lighting and fan wiring. Switch and socket for light and power shall be separate units and not combined one.	
9.	Balancing of circuits in three phases installed shall be arranged before installation is taken up. Unless otherwise specified not more than ten light points shall be grouped on one circuit and the load per circuit shall not exceed 1000 watts.	

10.3. Cable Work

#	Description	Bidder Compliance (Yes/No)
1.	Cable ducts should be of such dimension that the cables laid in it do not touch one another. If found necessary the cable shall be fixed with clamps on the walls of the duct. Cables shall be laid on the walls/on the trays as required using suitable clamping/ fixing arrangement as required. Cables shall be neatly arranged on the trays in such manner that a criss-crossing is avoided and final take off to switch gear is easily facilitated. Cable shall be laid as per the IS standard	

#	Description	Bidder Compliance (Yes/No)
2.	All cables will be identified close to their termination point by cable number as per circuit schedule. Cable numbers will be punched on 2mm thick aluminium strips and securely fastened to the. In case of control cables all covers shall be identified by their wire numbers by means of PVC ferrules. For trip circuit identification additional red ferrules are to be used only in the switch gear / control panels, cables shall be supported so as to prevent appreciable sagging. In general distance between supports shall not be greater than 600mm for horizontal run and 750mm for vertical run.	
3.	Each section of the rising mains shall be provided with suitable wall straps so that same the can be mounted on the wall.	
4.	Whenever the rising mains pass through the floor they shall be provided with a built-in fire proof barrier so that this barrier restricts the spread of fire through the rising mains from one section to the other adjacent section. Neoprene rubber gaskets shall be provided between the covers and channel to satisfy the operating conditions imposed by temperature weathering, durability etc.	
5.	Necessary earthling arrangement shall be made alongside the rising mains enclosure by Mean of a GI strip of adequate size bolted to each section and shall be earthed at both ends. The rising mains enclosure shall be bolted type.	
6.	The space between data and power cabling should be as per standards and there should not be any criss-cross wiring of the two, in order to avoid any interference, or corruption of data.	

10.4. Road Marking

The System Integrator shall provide and apply 2.50mm thick hot applied thermoplastic road marking of White/Yellow colour on bituminous/ concrete surface with fully automatic machines as per detailed plan of feasibility report and engineer in charge approval. SI shall responsible to paint the road markings in every 6 months or instructed by authority from SSCDL.

As per MORTH clause 803 of Volume 2 Part 2, the junction markings shall include the following types:

#	Description	Bidder Compliance (Yes/No)
1.	Edge line marking of 15 cm width	
2.	Centre line marking of 10 cm width	
3.	Pedestrian markings at junctions (Zebra Crossing)	
4.	Pedestrian markings at junction (Stop Line)	
5.	Letter markings at junctions	
6.	Direction arrow markings at junctions	
7.	Lane marking of 15 cm width	

The System Integrator shall undertake the junction markings complying to MORTH and IRC standards which are listed below:

#	Description	Bidder Compliance (Yes/No)
1	**General** The colour, width and layout of road markings shall be in accordance with the Code of Practice for Road Markings with paints, IRC : 35, and as specified in the drawings or as directed by the Engineer.	
2.	**Material** Road markings shall be of ordinary road marking paint, hot applied thermoplastic compound, or reflectorized paint as specified in the item and the material shall meet the requirements as specified below.	
3.	**General**	

#	Description	Bidder Compliance (Yes/No)
a.	The work under this section consists of marking traffic stripes using a thermoplastic compound meeting the requirements specified herein.	
b.	The thermoplastic compound shall be screeded / extruded on to the pavement surface in a molten state by suitable machine capable of controlled preparation and laying with surface application of glass beads at a specific rate. Upon cooling to ambient pavement temperature, it shall produce an adherent pavement marking of specified thickness and width and capable of resisting deformation by traffic.	
c.	The colour of the compound shall be white or yellow OS colour No. 356) as specified in the drawings or as directed by the Engineer.	
d.	Where the compound is to be applied to cement concrete pavement, a scaling primer is recommended by the manufacturer, shall be applied to the pavement in advance of placing of the stripes to ensure proper bonding of the compound. On new concrete surface any laitance and/or curing compound shall be removed before die- ftrwkings am applied.	
4.	**Hot Applied Thermoplastic Road Marking** **Thermoplastic Material**	
a.	The thermoplastic material shall be homogeneously composed of aggregate, pigment, resins and glass reflectorizing beads.	
b.	The pigment, beads and aggregate shall be uniformly dispersed in the resin. The material shall be free from all skins, dirt and foreign objects and shall comply with requirements indicated in Table below.	

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#	Description	Bidder Compliance (Yes/No)
c.	The Thermoplastic Paints shall be of ASIAN / BERGER Brand Only	

The following minimum proportions of constituents of marking material shall be followed:

#	Component	White	Yellow	Bidder Compliance(Yes/No)
1.	Binder	18.0 Min.	18.0 Min.	
2.	Glass Beads	30-40	30-40	
3.	Titanium Dioxide	10.0 min.	--	
4.	Calcium Carbonate and Inert fillers	42.0 Max.	See	
5.	Yellow Pigments	--	Note	

Table: Proportions of Constituents of Marking material (Percentage by weight)

a) Amount of yellow pigment, calcium carbonate and inert fillers shall be at the option of the manufacturer, provided all other requirements of this specification are net.

b) The properties of thermoplastic material, when tested in accordance with ASTM D36/BS-3262-(Part-I), shall be as below:

#	Description	Bidder Compliance (Yes/No)
1.	**Luminace** • White: Day light luminance at 45 degree-65 per cent min. as per AASHTO M-249 • Yellow: Day light luminance at 45 degrees-45 per cent min. as per AASHTO M-249.	
2.	**Drying time**: When applied at a temperature specified by the manufacturer and to the required thickness, the material shall set to bear traffic in not more than 15 minutes.	

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#	Description	Bidder Compliance (Yes/No)
3.	**Skid resistance**: not less than 45 as per BS 6044.	
4.	**Cracking resistance at low temperature:** The material shall show no cracks on application to concrete blocks.	
5.	**Softening point**: 102.5;t9.5 degree C as per ASTM D-36.	
6.	**Flow resistance**: Not more than 25 per cent as per AASHTO M-249.	
7.	Yellowness index (for white thermoplastic paint): not more than 0.12 as per AASHTO M-249.	
1.	**Storage life:-**The material shall meet the requirements of these specifications for a period of one year. The thermoplastic material must also melt uniformly with no evidence of skins or un-melted particles for the one year storage period. Any material not meeting the above requirements shall be replaced by the manufacturer/supplier/contractor.	
2.	**Reflectorisation:** - Shall be achieved by incorporation of beads, the grading and other properties of the beads shall be as specified in Reflectorizing glass beads.	
3.	**Marking**:- Each container of the thermoplastic material shall be clearly and indelibly marked with the following information: • The name, trade mark or other means of identification of manufacturer • Batch number • Date of manufacturer • Colour (white or yellow) • Maximum application temperature and maximum safe heating temperature.	
4.	**Sampling and testing:** The thermoplastic material shall be sampled and tested in accordance with the appropriate ASTM/BS method. The contractor shall furnish to the	

#	Description	Bidder Compliance (Yes/No)
	employer a copy of certified test reports from the manufacturers of the thermoplastic material showing results of all tests specified herein and shall certify that the material meets all requirements of this specification	

REFLECTORISING GLASS BEADS

a) This specification covers two types of glass beads to be used for the production of reflectorized pavement markings.

b) Type-1 beads are those which are a constituent of the basic thermoplastic compound vide above table and beads are those which are to be sprayed on the surface vide Clause table. The glass beads shall be transparent, colourless and free from milkiness, dark particles and excessive air inclusions.

c) Specific requirements:-

1. **Gradation:-** The glass beads shall meet the gradation requirements for the two types as given table below:

#		Sieve Size	Per cent retained		Bidder Compliance(Yes/No)
			Type-1	Type-2	
a.		1.18 mm	0 to 3	--	
b.		850 Micron	5 to 20	0 to 5	
c.		600 Micron	--	5 to 20	
d.		425 Micron	65 to 95	--	
e.		300 Micron	--	30 to 75	
f.		180 Micron	0 to 10	10 to 30	
g.		below 180 Micron	--	0 to 5	

Gradating Requirements for Glass Beads

#	Description	Bidder Compliance (Yes/No)
2.	**Roundness:** The glass beads shall have a minimum of 70 per cent true spheres.	

#	Description	Bidder Compliance (Yes/No)
3.	**Reflective Index**: The glass beads shall have a minimum reflective index of 1.50.	
4.	**Free flowing properties:-**The glass beads shall be free of hard lumps and clusters and shall dispense readily under any conditions suitable for paint striping. They shall pass the free flow test.	

Application properties of thermoplastic material

#	Description	Bidder Compliance (Yes/No)
1.	The thermoplastic material shall readily get screeded/extruded at temperatures specified by the manufacturers for respective method of application to produce a line of specified thickness which shall be continuous and uniform in shape having clear and sharp edges.	
2.	The material upon heating to application temperatures, shall not exude fumes, which are toxic, obnoxious or injurious to persons or property.	
3.	**Preparation**	
a.	The material shall be melted in accordance with the manufacturer's instructions in a heater fitted with a mechanical stirrer to give a smooth consistency to the thermoplastic material to avoid local overheating. The temperature of the mass shall be within the range specified by the manufacturer, and shall on no account be allowed to exceed the maximum temperature stated by the manufacturer. The molten material should be used as expeditiously as possible and for thermoplastic material which has natural binders or is otherwise sensitive to	

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#	Description	Bidder Compliance (Yes/No)
	prolonged heating, the material shall not be maintained in a molten condition for more than 4 hours.	
b.	After transfer to the laying equipment, the material shall be maintained within the temperature range specified by the manufacturer for achieving the desired consistency for laying.	
4.	**Properties of finished road making:-**.	
a.	The stripe shall not be slippery when wet.	
b.	The making shall not lift from the pave in freezing weather. After application and proper drying, the stripe shall show no appreciable deformation or discolouration under traffic and under road temperatures upto 60 degree C.	
c.	The marking shall not deteriorate by contract with sodium chloride, calcium chloride or oil drippings from traffic.	
d.	The stipe or marking shall maintain its original dimensions and position. Cold ductility of the material shall be such as to permit normal movement with the road surface without chopping or cracking.	
e.	The colour of yellow marking shall conform to IS Colour No.356 as given in IS-164	

REFLECTORISED PAINT

a) Reflectorized paint, if used, shall conform to the specification by the manufacturers and approved by the Engineer. Reflectorizing glass beads for reflectorizing paints where used shall conform to the requirement of Clause table

APPLICATION

#	Description	Bidder Compliance (Yes/No)
1.	Marking shall be done by machine. For locations where painting cannot be done machine, approved manual methods shall be used with prior approval of the Engineer. The Contractor shall maintain control over traffic while painting operations are in progress so as to cause minimum inconvenience to traffic compatible with protecting the workmen.	
2.	The thermoplastic material shall be applied hot either by screeding on extrusion process. After transfer to the laying apparatus, the material shall be laid at a temperature within the range specified by the manufacturer for the particular method of laying being used. The paint shall be applied using a screed or extrusion machine.	
3.	The pavement temperature shall not be less than 10 decree C during application. All surfaces to be marks shall be thoroughly cleaned of all dust, dirt, grease, oil and all other foreign matter before application of the paint.	
4.	The material, when formed into traffic stripes, must be readily renewable by placing an overlay of new material directly over an old line of compatible material. Such new material shall so bond itself to the old line that no splitting or separation takes places.	
5.	Thermoplastic paint shall be applied in intermittent or continuous lines of uniform thickness of at least 2.5 mm unless specified otherwise. Where arrows or letters are to be provided, thermoplastic compound may be hand sprayed.	
6.	In addition to the beads included in the material, a further quantity of glass beads of Type-2, conforming to the above noted specification shall be sprayed uniformly into a mono-layer on to the hot paint line in quick succession of the paint spraying operation. The glass beads shall be applied at the rate of 250 grams per square meter area.	
7.	The minimum thickness specified is exclusive of surface applied glass beads. The method of thickness measurement shall be in accordance with Appendices B and C of BS-3262 (Part-3).	
8.	The finished lines shall be free from ruggedness on sides and ends and be parallel to the general alignment of the carriageway. The upper surface of the lines shall be level,	

#	Description	Bidder Compliance (Yes/No)
	uniform and free from streaks upper surface of the lines shall be level, uniform and free from streaks.	
9.	Marking: - Marking like lane markings, centre line marking and edge line marking shall be done strictly as prescribed in IRC-35-1977.	

11. Annexure V: Common guidelines regarding compliance of systems/equipment

1. The specifications mentioned for various IT / Non-IT components are indicative requirements and should be treated for benchmarking purpose only. SIs are required to undertake their own requirement analysis and may propose higher specifications that are better suited to the requirements.

2. Any manufacturer and product name mentioned in the Tender should not be treated as a recommendation of the manufacturer / product.

3. None of the IT / Non-IT equipment's proposed by the SI should be End of Life product. It is essential that the technical proposal is accompanied by the OEM certificate in the format given in Volume I of this Tender, where-in the OEM will certify that the product is not end of life product & shall support for at least 6 years from the date of Bid Submission.

4. All IT Components should support IPv4 and IPv6

5. Technical Bid should be accompanied by OEM's product brochure / datasheet. SIs should provide complete make, model, part numbers and sub-part numbers for all equipment/software quoted, in the Technical Bid.

6. SI should ensure that only one make and model is proposed for one component in Technical Bid for example all Traffic Surveillance cameras must belong to a single OEM and must be of the same model etc.

7. SIs should ensure complete warranty and support for all equipment from OEMs. All the back-to-back service agreements should be submitted along with the Technical Bid.

8. All equipment, parts should be original and new.

9. The user interface of the system should be a user friendly Graphical User Interface (GUI).

10. Critical core components of the system should not have any requirements to have proprietary platforms and should conform to open standards.

11. For custom made modules, industry standards and norms should be adhered to for coding during application development to make debugging and maintenance easier. Object oriented programming methodology must be followed to facilitate sharing, componentizing and multiple-use of standard code. Before hosting the application, it shall be subjected to application security audit (by any of the CERTIN empanelled vendors) to ensure that the application is free from any vulnerability; and approved by the Police Department.

12. All the Clients Machines / Servers shall support static assigned IP addresses or shall obtain IP addresses from a DNS/DHCP server.

13. The Successful SI should also propose the specifications of any additional servers / other hardware, if required for the system.

14. The indicative architecture of the system is given in this volume. The Successful SI must provide the architecture of the solution it is proposing.

15. The system servers and software applications will be hosted in Data Centres as specified in the Bid. It is important that the entire set of Data Centre equipment are in safe custody and have access from only the authorized personnel and should be in line with the requirements & SLAs defined in the Tender.

16. The Servers provided should meet industry standard performance parameters (such as CPU Utilisation of 60 percent or less, disk utilisation of 75 percent or less). In case any non-standard computing environment is proposed (such as cloud), detail clarification needs to be provided in form of supporting documents, to confirm (a) how the sizing has been arrived at and (b) how SLAs would be met.

17. SI is required to ensure that there is no choking point / bottleneck anywhere in the system (end-to-end) and enforce performance and adherence to SLAs. SLA reports must be submitted as specified in the Bid without fail.

18. All the hardware and software supplied should be from the reputed Original Equipment Manufacturers (OEMs). The Department reserves the right to ask replacement of any hardware / software if it is not conforms to all the requirements specified in the tender documents

19. All servers, active networking components (except for edge level switches), security equipment, storage systems and COTS Application (except C4i/Command and Control applications) proposed should be from OEMs who are amongst the top 5 for world-wide market share in terms of revenue as per IDC latest published quarterly report presence in the latest Magic Quadrant of Gartner. SI is expected to attach the report along with the Technical Bid.

20. The proposed ATCS system by the bidder shall be compatible & integrated with the existing application. SDK/API/All Communication & Program protocol related to hardware & software of the existing ATCS System shall be provided to the selected bidder by the SSCDL without any additional cost.

21. SSCDL will provide SDK/API required for the ATCS component with existing E-Challan platform without any additional cost. However bidder is responsible for the integration.

22. Server for ITCS solutions such as Variable Messaging Sign (VMS) Server, Traffic Surveillance Cameras-Management Server, Traffic Surveillance Cameras-Recording Server, Analytics Server, ANPR Server, Traffic Analytics Server for Mid-Block VMS System, RLVD Server, Speed Detection Server, EMS Server, Mobile App Server, Database Server, ECB System Server, e-Challan Server etc., should have no single point of failover.

23. Cameras and the Video Management / Video Analytics Software should be ONVIF Core Specification '2.X' or 'S' compliant and provide support for ONVIF profiles such as Streaming, Storage, Recording, Playback, and Access Control.

24. System Integrator shall place orders on various OEMs directly and not through any sub-contractor / partner. All licenses should be in the name of the SSCDL / SMC.

25. Initially data centre & control centre may established at different or same location. However both of them will be migrated to IT-MAC once it gets operational. The detail of the location of temporary DC & CC will be shared with the selected vendor. SSCDL will ensure that sufficient space shall be allocated to the selected bidder.

26. Bidder shall be responsible to file FIR in nearest Police Station for any theft or physical damage of product under ITCS Project (including cable & accessories) due to any unforeseen reason. The SI shall have to submit the copy of FIR to SSCDL/SMC within 7 days from the date of filing FIR.

27. SI shall have to take approval from SSCDL/SMC for Schematic drawing of junction box or any fabrication work.

28. Painting of pole shall be part of CAMC & SI shall have to do the same in every 2 year till the contract period. Cleaning of traffic signal aspect shall have to do in every 2 months till the contract period.

29. Minimum Specifications of the product is mentioned in the RFP. However SI can offer better specs, if required to meet the SLA.

30. Vendor shall have to take approval for schematic diagram of all components under ITCS Project from SSCDL before supply.

31. The SSCDL needs to be fully informed of the results of the survey and the amount and extent of the demolition and site clearance shall then be agreed with the SSCDL. Selected bidder has to inform & take necessary approval from SSCDL/SMC in advance (minimum 2 weeks) for the digging or excavation required wrt ROW/RI. The bidder is required to submit the detailed plan with drawing for approval

32. The selected bidder is expected to deploy an application that can report consolidated quarterly SLA performance report. Further Volume 2 of RFP provides the functionalities of EMS which will be deployed by the selected bidder for efficient management of the system, reporting, SLA monitoring and resolution of issues

33. Provision of the Internet bandwidth requirement to host the web application shall be in scope of the SI.

12. Annexure VI: Minimum Qualification Criteria for Manpower

#	Minimum Qualifications
1	**Project Director**
	• Minimum 15 years of experience, Min. 10 years of large project experience • Minimum 10 years of domain experience (ICT based traffic management) • Should have experience of minimum 1 assignment of implementation of Adaptive Traffic Management System in India / globally • **Minimum Qualification:** BE/B. Tech + MBA / M. Tech
2	**Project Manager**
	• Minimum 10 years of experience, Min. 5 years of large SI project experience • Minimum 5 years of domain experience (ICT based traffic management) • Minimum 3 Years of experience in Transportation Domain • Minimum 1 large similar (similar to Pune ATCS Project) project experience • **Minimum Qualification:** BE/B. Tech + MBA / M Tech
3	**Technical Expert- Traffic Command Center Expert**
	• Minimum 10 years of experience, Min. 5 years of experience in coordinating operation management support activities for ITCS or similar projec • Should have experience of at least one project in setting up Command and Control Centre & handling operation & maintenance • **Minimum Qualification:** BE/B. Tech or Graduation / Post Graduation in Transportation
4	**Technical Expert: Intelligent Transport Systems**
	• Minimum 10 years of experience, Min. 5 years of experience in transportation domain • Should have experience of at least one project in design implementation of Intelligent (preferably Adaptive) Traffic Management System • Should have experience in real time adaptive traffic control systems (on the product quoted by the bidder) • Experience in setting up Command and Control Centre & handling operation & maintenance would be added advantage • **Minimum Qualification:** BE/B. Tech or Graduation / Post Graduation in Transportation
5	**Technical Expert: Network & Security**
	• Minimum 10 years of experience, Min. 5 years of experience in IT Networks & Security • Should have experience of at least one project in design implementation of large IT Network & Security for similar project

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#	Minimum Qualifications
	• Certification in Networking (CCNA or Equivalent) • **Minimum Qualification:** BE/ B. Tech
6	**Technical Executive: Server, Storage, EMS & Software Applications**
	• Minimum 10 years of experience, Min. 5 years of experience in managing applications, servers and storage • Should have experience of at least one project in design implementation of large IT project • **Minimum Qualification:** BE/ B. Tech

13. Annexure VII: Traffic Signal Pole Design

Please refer to the separate PDF for Pole design