Karimnagar Smart City Corporation Limited (KSCCL)

Intelligent Traffic Management System

Introduction and System Architecture (Illustrative)

Introduction

Karimnagar Background :

Karimnagar is the trade and commercial hub of northern Telangana and the third largest city in the state. With the vison “To develop Karimnagar into a major Commercial, and Tourism Hub in Northern Telangana facilitated through digital transformation of City life, and to create an Inclusive, Skilled and Gender-sensitive society.”

Objective of the project :

The objective of Karimnagar Smart City project is to improve core infrastructure, improve quality life of citizens, provide a clean and sustainable environment and improve efficiency and accountability by application of ITMS Solution. In order to provide secure and pleasant experience to citizens of Karimnagar, ITMS project is proposed. Traffic projects are meant for achieving multi-objectives while meeting the basic needs of the Citizen - Mobility and Accessibility in Karimnagar

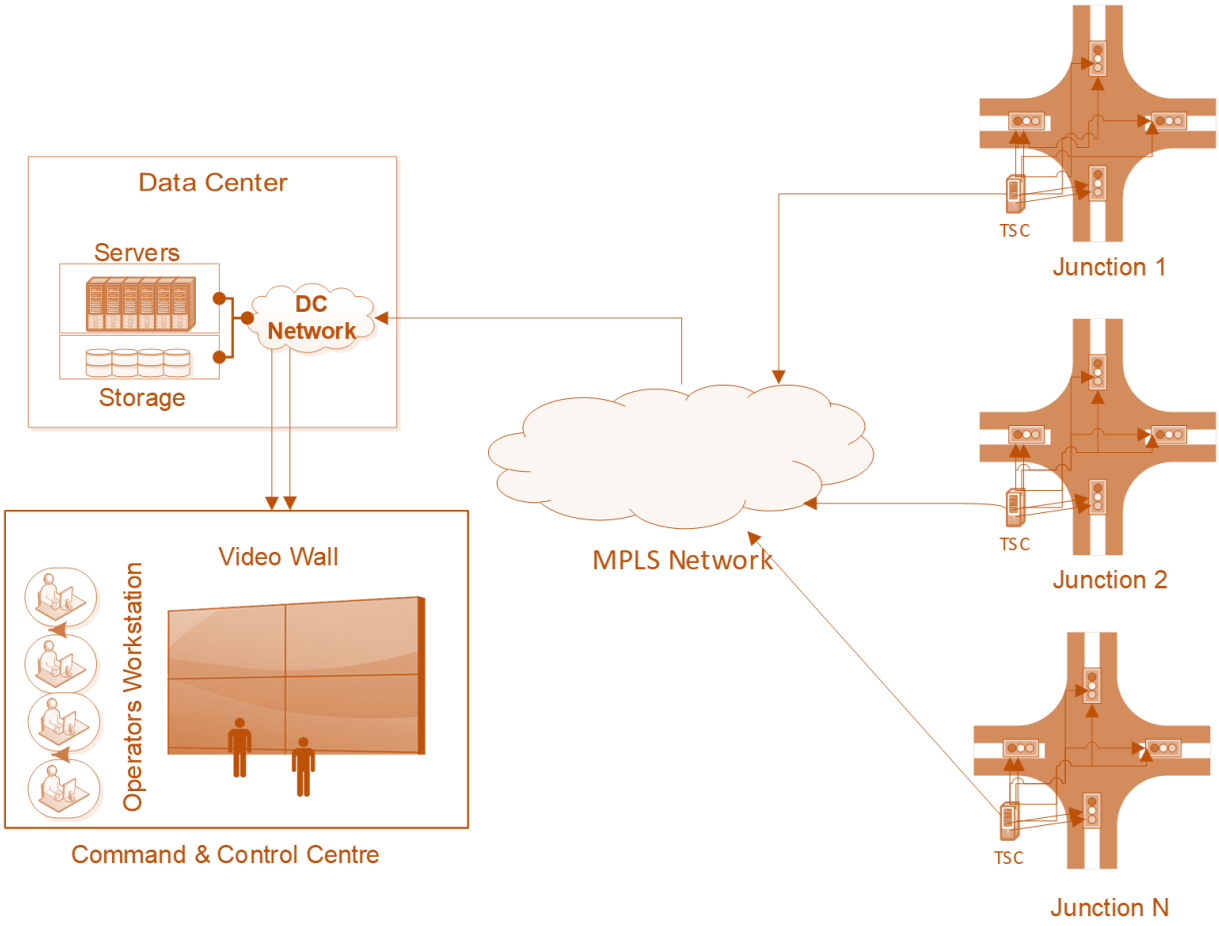
ITMS Project Core Solution

1. **Traffic signals:** Smart traffic signal system forms the core of the traffic management part on the field. Traffic signaling system aims to reduce collisions and waiting time for both vehicles and pedestrian users. The ITMS system will primarily involve the installation of vital infrastructure of Traffic Management like traffic signals, pelican signals, timers
2. **Flashing beacons:** Solar based Flashing beacons will be installed wherever applicable across the Karimnagar City. Flashing beacons to be installed on identified junctions with low traffic volumes
3. **Traffic Enforcement system:** Violations of traffic laws result in the needless death of thousands of individuals and injury to many more each year. Many of the deaths and injuries would not have occurred if drivers had obeyed the existing traffic laws. Below is the list of violations which KSCCL plans to capture
    - Over speed
    - Signal jump
    - Stop line crossing
    - Triple riding
    - Without helmet
    - Cellphone driving
    - Without seat belt
    - Wrong side driving
    - Dangerous driving (projections, over loading of passengers/goods, etc.)

System Architecture (Illustrative) :

The main components of ITMS project and block diagram are given below

Illustrative System Architecture



System Components:

1. **Field components:** These components like ANPR cameras, VAC cameras, poles, junction boxes and network equipment are installed on the junctions physically.
2. **IT Infrastructure**: The IT infrastructure like servers for compute, storages are installed in a server room/ data centre. This infrastructure will be used to process the data received from the field IoTs.

3. **Viewing centre**: The complete city traffic infrastructure can be monitored and managed from a single location which is a centralized command and control centre. The operators sitting in the command centre manage the traffic network and also manage the alerts generated by the system. The operators also manage the enforcement systems and promote the discipline among the commuters.
4. **Network:** It is a backbone for this ITMS project and shall be connecting enforcement system, signal components to the viewing center and the SI/SA will require network connection to provide uninterrupted service

Indicative/Tentative Bill of Materials

Traffic Signal System

Sl. No.	Line Item	Unit	Qty	Unit Price (INR)	Tax Rate	Total (Incl Taxes)
A	B	C	D	E	F	G=D*E+(D*E*F)
Traffic Signal System						
1	Traffic signal Controller (Scalable to ATC) operates on both DC and AC power sources as per requirement	Nos	1			-
2	Straight Pole as per standards	Nos	1			-
3	Cantilever pole as per standards	Nos	1			-
4	Junction boxes for cable terminations	Nos	1			-
5	**LED Signal Lamps (Single source)**					
5.1	RED Blow	Nos	1			-
5.2	Amber Blow	Nos	1			-
5.3	Green arrow /U turn/Amber arrow	Nos	1			-
5.4	NRT/NLT/NUT Stencils	Nos	1			-
5.5	Led Housing	Nos	1			-
6	Count down timer vehicular (Graphical)	Nos	1			-
7	Count down timer Pedestrian(Graphical)	Nos	1			-
8	SS-Power supply box	Nos	1			-
9	Supply of 120/100 mm(OD/ID)HDPE-DWC ducts	Mts	1			-
10	Supply of 50/37 mm(OD/ID)HDPE-DWC ducts	Mts	1			-
11	Construction of Chamber(450mm x 450mm x 600 mm) with FRP Chamber Covers (510 x 510 x 35 mm with min load capacity of 12.5T)	Nos	1			-
12	Supply of 8 core armored Cable	Mts	1			-
13	Supply of 16 core armored Cable	Mts	1			-
14	Provisioning of Network and Network equipment's (8/4 port)	Nos	1			-
15	UPS/DCPS with 2 Hrs. back up	Nos	1			-
16	Supply of junction box for housing the UPS,LPU,N/w switch etc	Nos	1			-
17	Supply of chemical earthing	Nos	1			-
	Any other (Bidder to add)					
Total for Traffic Signal Infra						-

Traffic Enforcement System

Sl. No.	Line Item	Unit	Qty	Unit Price (INR)	Tax Rate	Total (Incl Taxes)
A	B	C	D	E	F	G=D*E+(D*E*F)
Traffic Enforcement system						
1	Automatic Number Plate Recognition (ANPR) Camera for the lanes	Nos	1			-
2	Infra-Red (IR) Illuminators	Nos	1			-
3	Wide angle Camera for capturing of Evidence of the incident	Nos	1			-
4	Local Processing Unit (LPU) with enclosure	Nos	1			-
5	Cantilever poles for mounting the ANPR cameras	Nos	1			-
6	Supply of CAT-6 Cables for connecting the ANPR and evidence camera	Mts	1			-
Total for Traffic Enforcement system						-

Solar Flasher System

Sl. No	Line Item	Unit	Qty	Unit Price (INR)	Tax Rate	Total (Incl Taxes)
A	B	C	D	E	F	G=D*E+(D*E*F)
Solar Flasher system						
1	Flasher controller	Nos	1			-
2	Solar panel	Nos	1			-
3	Battery for flasher	Nos	1			-
4	Red/Amber LED aspect	Nos	1			-
5	Straight pole with necessary mounting arrangements	Nos	1			-
Total for Solar Flasher system						-

CCC Components

Sl. No.	Line Item	Unit	Qty	Unit Price (INR)	Tax Rate	Total (Incl Taxes)
A	B	C	D	E	F	G=D*E+(D*E*F)
CCC Components						
1	Workstations for Operator for Enforcement and Traffic Managements with 2 monitor setups – xoen or equivalent based workstation	Nos	1			-
2	2x2-47" Video wall with and controller with associated accessories	Nos	1			-
3	Manageable Core Switch	Nos	1			-
4	New Generation Firewall	Nos	1			-
5	42 U Network Rack	Ls	1			-
6	Server for enforcement and traffic management solution (5 servers with 20 core and 96 GB)	Ls	1			-
7	Storage for enforcement and traffic management solution(5TB)	Ls	1			-
8	Central Traffic management and monitoring software	Ls	1			-
9	Traffic Enforcement analytics and software	Ls	1			-
10	Worktable and Furnitures (4 chairs and 4 tables)	Ls	1			-

Installation Cost

Sl. No.	Line Item	Unit	Qty.	Unit Price (INR)	Tax Rate	Total (Incl Taxes)
A	B	C	D	E	F	G=D*E+(D*E*F)
Traffic Signal System						
1	Traffic signal Controller Scalable to ATC operates on both DC and AC power sources as per requirement	Nos	1			-
2	Straight Pole as per standards	Nos	1			-
3	Cantilever pole as per standards	Nos	1			-
4	Junction boxes for cable terminations	Nos	1			-
5	**LED Signal Lamps (Signal Source LED') & Housing**	Nos	1			-
6	Count down timer vehicular (Graphical)	Nos	1			-
7	Count down timer Pedestrian(Graphical)	Nos	1			-
8	SS-Power supply box	Nos	1			-
9	Laying of 120/100 mm(OD/ID)HDPE-DWC ducts	Mts	1			-
10	Laying of 50/37 mm(OD/ID)HDPE-DWC ducts	Mts	1			-
11	Construction of Chamber(450mm x 450mm x 600 mm) with FRP Chamber Covers (510 x 510 x 35 mm with min load capacity of 12.5T)	Nos	1			-
12	Foot Path/Soft soil Cutting	Mts	1			-
13	Carriageway cutting	Mts	1			-
14	Laying of 8 core armored Cable	Mts	1			-
15	Laying of 16 core armored Cable	Mts	1			-
16	Construction of Controller foundation (600 mm above and 600 mm below ground with M20 grade cc)	Nos	1			-
17	Deposit charges for power supply connection	Nos	1			-
18	Installation of filed switch	Nos	1			-
19	UPS/DCPS with 2 Hrs. back up	Nos	1			-
20	Installation of junction box for housing the UPS,LPU,N/w switch etc	Nos	1			-
21	Installation of earthing	Nos	1			-
	Any other (Bidder to add)					

Total installation cost for Traffic signaling system on Field						-
Traffic Enforcement System						
22	Automatic Number Plate Recognition (ANPR) Camera for the lanes	Nos	1			-
23	Infra-Red (IR) Illuminators	Nos	1			-
24	Camera for capturing of Evidence of the incident	Nos	1			-
25	Local Processing Unit (LPU) with enclosure	Nos	1			-
26	Cantilever poles for mounting the ANPR cameras	Nos	1			-
27	Road/Soft soil cutting	Mts	1			-
28	Laying of CAT-6 Cables for connecting the ANPR and evidence camera	Mts	1			-
Total installation cost for Enforcement System on Field						-
Installation cost for CCC infrastructure						
29	Workstations for Operator for Enforcement and Traffic Managements with 2 monitor setups – xoen or equivalent based workstation	Nos	1			-
30	2x2-47" Video wall with and controller with associated accessories	Nos	1			-
31	Manageable Core Switch	Nos	1			-
32	New Generation Firewall	Nos	1			
33	42 U Network Rack	Ls	1			-
34	Server for enforcement and traffic management solution (5 servers with 20 core and 96 GB)	Ls	1			-
35	Storage for enforcement and traffic management solution(5TB)	Ls	1			-
36	Central Traffic management and monitoring software with ATC feature	Ls	1			-
37	Traffic Enforcement analytics and software	Ls	1			-
38	Worktable and Furnitures (4 chairs and 4 tables)	Ls	1			-
	Any other (Bidder to add)					
Total installation cost for CCC						-
Solar Flasher System						
39	Flasher controller	Nos	1			-
40	Solar panel	Nos	1			-

41	Battery for flasher	Nos	1			-
42	Red/Amber LED aspect	Nos	1			-
43	Straight pole with necessary mounting arrangements	Nos	1			-
	Any other (Bidder to add)					
Total Installation cost for Flasher unit						-

Note:

- Network charges to be included for all connectivity
- China products are not recommended/entertained

Technical Specifications

Technical components & specifications

A. Traffic signal Controller (scalable to ATC & VAC -ATC Model)
B. Signal Poles
    i. Straight pole
    ii. Cantilever pole
C. Junction boxes for cable terminations
D. LED signal lamps
    i. RED Blow
    ii. Amber Blow
    iii. Green arrow /U turn/Amber arrow
    iv. NRT/NLT/NUT Stencils
    v. Led Housing
E. Count down timer (Vehicular & Pedestrian Graphical Type)
F. SS-Power box
G. HDPE-DWC ducts (120OD/100ID & ducts 50OD/37ID HDPE-DWC)
H. Chambers and FRP Chamber Covers (510 x 510 x 35 mm with min load capacity of 12.5T)
I. Cables 8 & 16/14/12 core armored Cable
J. Controller foundation (600 mm above and 600 mm below ground with M20 grade cc)
K. UPS/DCPS with 2 Hrs. back up
L. Automatic Number Plate Recognition (ANPR) & Evidence camera
M. Local Processing Unit (LPU)
N. Field network switch
O. Solar flashing blinker with pole and all accessories
P. Traffic Command Control Center (TCCC)
    i. Workstations
    ii. Videowall with controller
    iii. Server & Storage
    iv. Core switch
    v. Network rack
    vi. Central traffic management software
    vii. Traffic Enforcement analytics and software
    viii. Connectivity

1.1.1 Traffic Signal Controller

The Traffic Signal Controller equipment shall be of minimum 32/64 bit microcontroller-based and shall have an advanced relay-based traffic signal lamp switching and a conflict monitoring facility to ensure that conflicting, dangerous or disallowed traffic signal displays.

a. All logical functions necessary external to the processor system shall be performed by the electronics sub-system. Timing functions shall be based on digital techniques implemented by the microcontroller-based system. Site specific configuration data shall be stored in a non-volatile memory device (FLASH memory) easily programmable at the site through keyboard entry and shall have the feature to update via central control center. No volatile memory shall be used for storing the junction specific plans or signal timings.
b. The controller shall have a health monitoring system that shall force the intersection to Flashing Amber when an error or device failure is detected. 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.
c. The standard controller shall provide a real time clock with battery backup that set and update the time, date and day of the week It shall also have the capability to update the time, date and day from the GPS or from a centrally connected server.
d. Data integrity should be verified during every power up and during each cycle change. An error shall force the system in flashing mode.
e. These modes include manual operation, flashing operation, pre-timed. It shall be capable of at least 16 distinctive signal timing plans. In addition, the Controller must be able to change the timing plans on its own according to time of day.
f. Manual operation shall require that this mode be selected locally, and that timing plan control be selected by some type of handheld switch operated from the door-in-door at the front of the cabinet.
g. The controller shall be equipped with the capability to prevent display of conflicting green signals on any two or more opposing phases. Should this condition occur, the controller shall have the capability to enter into all red condition for the conflicting signal indications or for entering the flashing mode of entire junction.
h. The proposed controller shall be equipped with the features of scalability to most modern operational technologies of vehicle actuated or Adaptive traffic signaling.(This is a future need however the controller should have the facility available so as whenever required the controller could be converted to the ATCS /Vehicle actuated based signaling by adding few PCB or cards)

1.1.2 Operational Modes

The traffic signal Controller shall have the following modes of operations

1.1.3 Manual Mode

This mode shall be entered upon actuation of a switch or control at the controller. Actuation of a hand-held switch shall then provide for controlled switching from one signal phase to another. However, this switching shall not interfere with preset minimum conditions such as minimum green, all red; minimum yellow, pedestrian clearance interval, etc. The phase sequence in this mode should be as per programmed plan at that time of the day.

1.1.4 Pre-Timed Mode

In this mode of operation, the signal controller shall operate only on the pre-programmed plans and will act as standalone signal only. The pre timed mode shall be in operating upon receipt of the proper commands from a controller. The timing plan changes shall then be controlled by an internal clock based upon time of day.

1.1.5 Flashing Mode

One flashing mode shall be included. It shall allow for yellow/Amber flashing on the main street and red flashing on the cross streets. The main and cross streets will be defined in the plans. The controller shall also be futuristic and shall be able to be scalable to higher version modes such as vehicle actuated and Adaptive traffic modes just by addition of additional cards or PCB's without changing the whole control unit.

1.1.6 Vehicle Actuation Mode

In the vehicle actuation with all stage's preemption mode, the traffic signal controller will 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 will be possible for all demand actuated stages. Cycle time may vary in every cycle execution

1.1.7 Semi-Actuation (Vehicle Actuation with Split Cycle length)

In this mode, the traffic signal controller will 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 will execute the Maximum green time configured for the stage. Preemption will be possible for all demand actuated stages. Cycle time may vary in every cycle execution.

1.1.8 Full Adaptive Traffic Control System (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. Pre-emption for all demand actuated stages except Priority Stage shall be possible in this mode.

1.1.9 Police Panel

For the special operations a weatherproof panel with few switches to be provided for the police personal to override the automated functions of the traffic controller at each intersection. The features to be provided under the police panel are as below:

1.1.10 Signal shutdown switch

Each controller shall be provided with a signal shutdown switch manually operated from the front panel for turning off the signals at the intersection. This switch shall only disconnect the power to the signals; it shall not affect any other part of the controller.

1.1.11 Manual Control

For use under special conditions, controllers shall be provided with means of substituting manual operation of interval timing shall provide the same interval sequence as when the controller is operating automatically. Manual interval timing shall be obtainable by means of a weather resisting hand operated push button switch mounted on a weatherproof cabinet exterior to the main control unit of the controller cabinet easily accessible by the operator. The transfer from manual to automatic operation, or vice versa, shall be accomplished by an auto manual switch, it shall not be necessary, when switching from manual to automatic operation, or vice versa, to do so at any certain time or to make any time adjustments. This switching shall not cause a conflict for any signal phases.

1.1.12 Emergency Stage/Hurry Call switches

The controller should have capability to call a specific programmed phase, when demanded. Minimum of 4 emergency stage call switches shall be available the controller. 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.

1.1.13 Forced Flash

The controller shall have the capability of forced flashing of red or amber with the activation of this switch.

1.1.14 Battery Backup

The battery backup of minimum 24 hours should be provided for control cards, clock, etc. to protect volatile data in case of power interruptions and failures.

1.1.15 Traffic management Software Functional requirement

The objective of the central traffic management software is to remotely monitor and actuate the signals from the control room as and when needed. The application software shall be capable to run on LINUX/WINDOWS platform.

The Central Traffic management software shall have the following functionalities:

a. Every junction connected to the Traffic command control center shall be graphically displayed with the status of the junction.
b. Operator shall be able to access individual junctions and monitor the cycle time and the stage being executed.
c. Operator shall be able to push the new timing plans to every intersections/ junction / group of junctions as per the need.
d. Shall be capable of maintaining database for time plan execution and system performance.
e. Shall be capable of maintaining and displaying database for error logs and system logs.
f. Shall be capable of generating reports on user request such as
    1. Stage Timing report
       The report shall give details of time at which every stage change has taken place.
    2. Stage switching report
       The report shall give details of time at which a stage switching has taken place.

3. Cycle Time switching report
   The report shall give details of time at which a cycle switching has taken place. The report shall show the cycle sequence and cycle timings for the cycle in a day.
4. Mode switching report
   The report shall give details of the mode switching taken place on a day.
5. Event Report
   The report shall show events generated by the controller with date and time.
6. Power on & down
   The report shall show time when the controller is switched on, and last working time of the controller.
7. Plan Change
   The report shall show the time of change of plan either through keypad or remotely through a PC or Server.
8. RTC Failure
   The report shall show the time when RTC battery level goes below the threshold value.
9. Time Update
   The report shall show the time when the Master controller updated its time either manually through keypad, automatically by GPS or through remote server.
10. Mode Change
    The report shall show the time when controller's operating mode is changed either manually through keypad or a remote server. The typical modes are FIXED, FULL VA SPLIT, FULL VA CYCLE, FLASH, LAMP OFF and HURRY CALL.
11. Lamp Status Report
    The report shall show lamp failure report with date and time of failure, color of the lamp and associated phase
12. Conflict
    The report shall show the conflict between lamps (RED, AMBER, GREEN) in the same phase or conflict between lamps of another phase.
13. Green Corridor

The central system should be able to create a green corridor for movement of ambulance and emergency vehicles. The system should have capability of creation of plans for VIP movements, etc.

The software shall allow the operator to actuate flash, junction off, hurry call functions on individual as well as a group of junctions as and when needed

1.1.16 Central traffic management software with ATCS

The over all monitoring and process related to the traffic signaling is done on this platform, this platform shall be a user-friendly GIS based GUI. The platform works either in line with ATCS algorithm if the proposed system is of ATC/VAC mode or shall work independently in fixed modes of operations.

In fixed mode of operation, the management software shall only help in view the status, access the individual junction and actuate the basic functionalities such as switch off, forced flash, time change etc. and keep track of the logs. The junctions shall work according to the time of the day and the cycle lengths that has been pretimed into the controller. There shall not be any real-time adaptation being initiated by the central traffic software.

The same when operated with ATC algorithm/software shall collect the real-time data fed from the vehicle detection cameras and shall process the same to change the cycle times of the junction or the corridor as per the demand. There is no manual intervention required as the corridor or junction shall adapt itself to the time demand of the hour vide the ATCS/AC mode.

The minimum functional specification is listed below.

S.No	Functional Specification	Compliance to Functional Specifications (Yes/No)	Remarks
1	This software shall be deployed and configured at data center or the designated server hub of KSCCL/Traffic CCC. The traffic signal system shall work on the Fixed Time control mode which set the signal cycle timing based on peak and non-peak hour of junction.		
2	The application shall be capable to cater to adaptive traffic control		

	strategic based on the future requirement of the city.		
3	The application shall be able to gather the data from the vehicle detector irrespective of detection technology.		
4	The application shall have component that develop appropriate stage timing plans for each approach of every intersection under the Traffic Signal System, based on real time demand.		
5	The application shall communicate with traffic signal controller and propose time plans to every intersection under the Traffic Signal System in every cycle. When operated in ATCS mode		
6	The application shall have database which maintain time plan execution and system performance.		
7	The application shall record all error logs and system logs and generate reports.		
8	Graphically present signal plan execution and traffic flow at the intersection		
9	Graphically present time space diagram for selected corridors		
10	The traffic signal system shall seamlessly integrate with central traffic management platform which shall generate all type of standard and custom report for planning and analysis		
11	The application shall generate alerts to the operator that trigger on customizable conditions in the network		
12	The application shall create a traffic data warehouse for all historic traffic information gathered from the		

	hardware installed on the road network.		
13	Network Status Display – This online display shall indicate with appropriate color-coding on-site map whether an intersection under the Fixed Time Mode. On double clicking the intersection, a link shall be activated for the traffic flow display for the intersection.		
14	Traffic Flow Display – This online display shall indicate the current traffic flow with animated arrows, mode of operation, stage number being executed and elapsed stage time.		
15	Saturation Snapshot – This display shall show the current saturation levels of all intersections in a corridor.		
16	Time-Space Diagram – The time-space diagram shall display the current stages being executed at every intersection in a corridor with immediate previous history		
17	Currently running stage and completed stages shall be identified with different colors.		
18	Stages identified for synchronization shall be shown in a different color.		
19	The system shall have other graphical interfaces for configuring the Traffic Signal System, as appropriate.		

1.1.17 Data entry to Local Controller

The data entry should be made through GSM/GPRS or wired connection to the central server. The controller should also be configurable through hand-held terminal, Data management terminal with capable interface. It should also support use of laptops for the programming.

The minimum require specification of the controller is as given below:

Technical Specification				
S No	Parameter	Description	Compliance to Specifications (Yes/No)	Remarks
1	CPU	32/64 Bit Microcontroller clocked at minimum of 20MHz.		
2	Program memory	Minimum of 512K Flash and 128K RAM		
3	Real Time Clock (RTC)	On-board RTC to set and update the time, date and day of the week through GPS and synchronization from central server with a tolerance of +/- 1 sec per day working on direct power with a battery backup of a minimum of 3 days.		
4	RTC update methods	Through ATCS server and GPS		
5	GPS Support	On Board GPS		
6	Time resolution	100 m-sec		
7	Controller type	Vehicle Actuated (VA)		
8	User interface (display& switch)	1. Minimum of 2 Line 16 Character LCD Display or showing the current working status and to view the configured parameters		
		2· Minimum of a single Push button Switch for Navigating to the next page for displaying configured Traffic Plan parameters.		

		3. By default, controller displays current running status page on display		
		4. For every key press display should show next pages with configured parameters till the last page then roll over.		
		5. If key is inactive for certain configured time period it should show the default page of current running status.		
9	Controller output switching	24 VDC 5A MOSFET based common negative switching		
10	No. of outputs	16 to 64 Scalable in group of 16		
11	Police control panel keys	· Lamp ON/OFF		
		· Forced Flash		
		· Manual/Auto toggle switch		
		· 4 Hurry Calls		
12	Vehicle detector input	· Minimum of 16 optically isolated inputs for Vehicle detection		
		· Compatible to Inductive loop sensors Camera Based detectors and Radar based detectors		
13	Status monitoring and debugging	Using RS232 port		
14	Log file retrieval Signal plan	Using Ethernet port		

15	Configuration	Through Laptop /PC locally and ATCS server remotely		
16	Working voltage	24 V DC +-10%		
17	Operating modes	· Pre–timed (TOD)		
		· Vehicle Actuated (VA):		
		o VA with all stage pre-emption		
		o VA with fixed cycle length		
		o Semi-actuated mode		
		o Stage Skipping		
		o ATCS		
		· Lamps Off		
		· Forced flash		
		· Manual		
		· Hurry Call		
18	Traffic plan parameters	· Minimum 32 – Phases		
		· Minimum 32 – Stages		
		· Minimum 24 – Cycle Plan		
		· Minimum 20 – Day Plan		
		· Minimum 04 – Week Plan		
		· Minimum 20 – Special Day Plan		
		· Minimum 04 - Season Plans		
		· Minimum 10 - Conflict Plan		
		· Minimum 04 - Hurry Call		
		· Minimum 16 - Vehicle detector input		

19	Programmable timings	Programmable timings from Minimum to maximum		
		· Start Amber: 3 – 10 Sec.		
		· All RED 3 – 10 Sec.		
		· Stage AMBER 2 – 10 Sec.		
		· RED Extension: 0 – 10 Sec.		
		· Min. GREEN time – 10 Sec.		
		· Manual Min. GREEN – 10 Sec.		
		· Cycle Offset: 0 – 300 Sec.		
		· Gap Count: 0 – 10 Sec.		
		· Stage Time: 10 – 255 Sec.		
20	Cycle transitions	Minimum of 32 cycle transitions per day in Pre–timed mode and unlimited cycle transitions per day in VA mode		
21	Event logs	Minimum of 500 events should be stored n EEPROM and all events should be viewed from PC/Laptop		
		· Power On/OFF		
		· Mode Change		
		· Time update		
		· Plan change		
		· RTC status		
		· Conflict status		
		· Vehicle Detector status		

		· Lamp Status		
22	Safety features	Inter/Intra Lamp Group Conflict Monitoring		
23	Cabinet construction	· MS powder coated with industrial grey colour and IP 55 protections		
		· Pole as well as Floor mount type		
24	Environmental conditions	· Temperature: 0°C to +55° C		
		· Relative Humidity 95%		
		· RH Non - condensing at +40°C		
25	Certification	Environmental certification as per the standard IEC 60068		
26	ATCS/VAC compatibility (As per option 2 proposed the controller shall have this feature in built to operate on ATC mode else option 1 shall have the scalability to ATC model by just adding a few PCB's of Firmware updates)	· Compatible ATC software		
		· Remote commands for o Lamp OFF		
		o Forced Flash		

		o Hurry Call		
		o RTC update		
		o Signal Plan update		

***Note*:**

The traffic controller minimum required specification is given. If Option II of the proposed solution is considered, the controller shall have the feature as listed in Sl. No 12 and 26 of the table above inbuilt into the controller for the ATC/VAC operations along with back end ATC software at CCC.

Else if the proposed solution II is considered, the scope is limited only to centrally view, manage and operate the controller junctions on standalone /fixed time mode of operation. ATCS and VA functions are futuristic scope only and the controller shall be able to be scaled to ATCS requirement with minimum addition of the electronics to the controller and the back-end software at the control center.

1.1.18 Signal Poles

All poles and posts shall comply with or exceed the requirements of BS505 or similar international approved specification as appropriate for use in India with regard to fabrication and steel content and shall be galvanized steel Class B, to BS729 or similar International standard. Signal poles shall have a diameter of 115mm with a height of 6m and a strength and rigidity at least equivalent to that for a seamless steel tube of 115mm outside diameter and 4.4mm thickness and a tensile strength of 375MN/m2. Signal poles shall be of a uniform diameter. Poles shall be short blasted with a crossover adhesive and dipped in a fluidized bed of PVC, to a thickness of 250/300 microns with a bitumen finish applied to the internal surfaces of the pole, alternatively a fully galvanized pole in accordance with BS729 or to a similar International standard shall be provided. All poles shall be polyethylene sleeved for protection.

1.1.19 Straight poles

Traffic signal poles are designed with the intention of offering corrosion resistance, longer life and are said of steel/aluminum makes. The range, types and lengths include straight poles and cranked poles used at pedestrian crossings and all types feature a mid-level termination design, which maintain a standard 114mm mounting diameter over the whole length. Each pole should

be characterized to ensure it is not overloaded either during initial installation or as part of a typical future junction improvement.

1.1.20 Standard Pole for Traffic Signal System specifications

S.No	Technical Specification	Compliance to Technical Specifications (Yes/No)	Remarks
1.	Pole type Hot Dip Galvanized after Fabrication with Silver coating of 86 micron as per IS:2629; Fabrication in accordance with IS-2713 (1980)		
2.	Height (ground-clearance): minimum 4.5 up to 6 meters, as per project site requirements. Based on the location requirement suitable size standard pole to be considered.		
3.	Pole Diameter: Minimum 10cm diameter pole (bidder to choose larger diameter for higher height)		
4.	Bottom base plate: Minimum base plate of size 30x30x1.5 cm		
5.	Mounting facilities: To mount Traffic signals, Pedestrian Signals, PA system Switch, etc.		
6.	Pipes, Tubes: All wiring must be hidden, through tubes/pipes. No wires shall be visible from outside		
7.	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. 100 cms		
8.	Protection: Lightning arrester shall be provided, to protect all field equipment mounted on pole		
9.	Wind bearing capacity of upto 100 kms per hour.		

1.1.21 Cantilever poles

Cantilever construction allows overhanging structures without external bracing, in contrast to constructions supported at both ends with loads applied between the supports, such as a simply

supported beam found in a post and lintel system. Karimnagar city has roads which needs cantilever poles so that during possessions and events, rotational option can be availed

1.1.22 Cantilever Pole for Traffic Signal System specifications

Sl No	Specification	Compliance to Specifications (Yes/No)	Remarks
1	Hot Dip Galvanized after Fabrication with Silver coating of 86 micron as per IS:2629; Fabrication in accordance with IS-2713 (1980)		
2	The height of cantilever shall be minimum 6.5 meter with clear view of signal aspects		
3	The pole diameter shall be minimum 10 cm.		
4	Minimum base plate of size 30x30x1.5 cm		
5	Mounting facilities: To mount Traffic signals, Pedestrian Signals, Switch, PA system etc		
6	Pipes, Tubes: All wiring must be hidden, through tubes/pipes. No wires shall be visible from outside		
7	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 minimum 120 cm (M-25 Foundation)		
8	Protection: Lightning arrester shall be provided, to protect all field equipment mounted on pole		
9	For cantilever galvanized pole / gantry: 6.00 Meters long Pole having diameter 125 mm with a base plate is 300 x 300 x 20 mm.		
10	Pole sheet thickness is 4mm, with a suitable Arm length of 4.5 meters.		

	Wind bearing capacity of min. 120 km/hr		

1.1.23 Junction boxes for cable termination

Junction boxes are an essential part of the electrical wiring systems for signals. The purpose of these boxes, which are often made from metal or plastic, is to house and safely protect a structure's electrical connections. The junction box shall be of the size 310 mm x 215 mm x 100 mm to accommodate the electrical connections of signal system. The junction box shall be fabricated out of M.S. material of thickness 2 mm or plastic. The door shall have internal lock to avoid any vandalism. The junction box should have IP55 protection. The junction box shall have internal electrical connecting strip with connectors for electrical connections.

1.1.24 LED Signal lamps

Traffic signal aspects are the visual indicators to the commuters and pedestrians on road and is to provide the right of way or direction of movement. Basically, in India 3 color of aspects are generally used to control the vehicular traffic movement and 2 for the pedestrians. The red aspect prohibits any traffic from proceeding in driving direction, the amber aspect alerts the incoming vehicles to be ready to stop or start. The green aspect has 3 type of arrow which allows traffic to proceed in the direction denoted. The pedestrian aspects are red man which indicates no right of way to cross the road and the Green walking man indicating has allowed the right of way to cross the road. Now a day's pedestrian aspects are being replaced by graphical multicolor countdown timers which help the pedestrians to judge the wait and allowed crossing time.

1.1.25 Single/Central Source LED's (Red, Amber & Green)

Model	Red	Amber	Green	Compliance to Specifications (Yes/No)	Remarks
LED	Hi-Flux 3 to 5	Hi-Flux 3 to 5	Hi-Flux 3		
Wavelength	613.5 - 631nm	585 - 597nm	498.5 - 508nm		
Brightness	400cd	400cd	400cd		
Power Source	180-270 VAC	180-270VAC	180-270VAC		
Solar	24V±10%DC	24V±10%DC	24V± 10%DC		

Wattage(max)	8W± 10%	8W± 10%	8W± 10%		
Power Factor	>0.9	>0.9	>0.9		
Operating Temp	-10to+70°C	-10to+70°C	-		
Humidity	5to95%	5to95%	5to95%		
Weight	<1.5 Kg	<1.5 Kg	<1.5 Kg		
Diameter	300mm	300mm	300mm		
Certification		EN12368			
Lens/Housing Material		Ultraviolet stabilized Poly			

1.1.26 NRT/ NLT/NUT Stencils

NLT: No left turn, NRT: No right turn, NUT: No U turn stencils, are used for indicative purposes and they may be set out using appropriate stencils on required junctions. They are available in different materials, sizes like 10”X48” , 14”X72”, etc.

1.1.27 LED Housing:

The materials used and the form of construction used shall be such as to ensure that the signal head (including visors, which are required) has adequate mechanical strength and durability to withstand the conditions of installation, operation and maintenance. In particular it shall be capable of withstanding winds of up to 100 km/h. The color of the signal body and visors shall be black UV stabilized high impact or impact modified Polypropylene. Materials, fixings and fastenings used shall be inherently corrosion resistant. The signal head shall be of modular construction, permitting signal head configurations to be built from standard building designed to be safe, vandal resistant and easy to install and maintain. Provide a secure locking action to prevent vandalism or movement of the signal head from the locked position. Fastenings used on signal heads and poles to gain internal access shall not require special tools and shall be wholly captive. The signal heads shall be provided with seals between all openings and these may be supplemented with knife-edge type seals to prevent the ingress of water. Visors shall be of sufficient size to adequately shade the aspects and to minimize phantom effects.

The signal head shall achieve a precise beam distribution, which produces high intensities of light in the center of the optic. The displayed symbols shall offer some form of protection against the adverse effects of phantom illumination of aspects.

1.1.28 Count Down Timer

Countdown timers are widely used in fixed time systems to intimate the commuters and the pedestrians about the waiting and crossing. This helps in better decision making. If a commuter is aware that he has to wait for longer time to get the clearance he may tend to switch of the vehicle and thus will effectively save fuel and reduce pollution. The vehicle countdown timers can be used for both pedestrian movement as well as the Vehicle movement also.

S.No	Technical Specification	Compliance to Technical Specifications (Yes/No)	Remarks
1.	The countdown timer shall be made from polycarbonate material which strengthened against UV rays with black or grey body color.		
2.	The dimension of CDT shall be 350mm x 350mm x 200mm or better		
3.	The CDT lamp diameter shall be minimum 300mm		
4.	The digit height of CDT shall be at least 150 mm or better for better visualization from road		
5.	The CDT shall be display in dual color red and green		
6.	The CDT shall display up to 2.5 digit which support to display from '0' to '199' count in red and green color.		
7.	The LED of countdown time shall be 5mm with better viewing angel of 30 degree from road intersection.		
8.	The wavelength of LED shall be preferably 630-640nm (Red), 505nm - 520nm (Green)		
9.	The CDT shall be function 12/24 VDC or 230 VAC power supply.		
10.	CDT shall be available with Ingress protection of IP 65 or better		

1.1.29 SS-Power box

The power supply box shall be made from S.S.304 material of thickness 1.6 mm. The power supply box shall be fabricated and shall be welded properly to obtain the protection class of IP-55. The burrs etc. shall be chamfered off and smooth finish surface shall be maintained. The Power Supply Box should have door at front with internal locking arrangement. The door shall be provided with neoprene rubber gasket and shall be air & watertight. The internal arrangement shall be provided to accommodate and fix the electric meter, cut outs and allied instruments. The Box shall have the glass or any other robust transparent material's window to note the meter reading without

physically opening the door. The glass/any other robust transparent material shall be of good quality and shall bear the temporary shocks or vibrations without breaking. The Power supply box shall be provided with press fit type of gland for the in & out entry of the cables. The Power Supply Box shall have arrangement for mounting on foundation or straight pole.

1.1.30 HDPE-DWC ducts (120OD/100ID & HDPE-DWC ducts 50OD37ID)

The ducts are provisioned to pull the cables under the soil and to protect them from the external wear and tears. The high-density polyethylene corrugated pipe to be used is to be conforming to IS 14930 (Part-2) including necessary sockets, couplings etc. Two types of ducts are being provisioned

a. HDPE Ducts with OD 120 mm and ID about 100 mm with a tolerance of +/- 5mm these ducts are used on the major road crossing and lengthy cable laying.
b. HDPE Ducts with OD 50 mm and ID of about 37 mm with a tolerance of +/- 5mm these ducts are used on chamber to pole connectivity.

1.1.31 Chambers & FRP Chamber Covers (510 x 510 x 35 mm with min load capacity of 12.5T)

The chambers shall be constructed to accommodate the conduits/ducts and cables and this chamber shall facilitate for the future ready maintenance of the cable faults and shall optimize the excavation at times of cable damages. The chambers shall be surface finished and there shall not be any uneven surface. The chamber shall be constructed as such it shall not obstruct any movement. Fiber-reinforced plastic (FRP) is the material used to make the covers for the chambers and shall be heavy duty type withstanding the normal force without breaking. There shall be no gap as such between the frame and chamber covers. The minimum gap shall be maintained which is otherwise required for easy operation. The covers shall have facility to lift the same for opening and closing operation.

S. No	Parameter	Description	Compliance to Specifications (Yes/No)	Remarks

1	Chamber Size	Excavate and install brick built or equivalent sectional chamber to be 450mm (L)X 450mm (B) X 600 mm(D) to tie into proposed 120 mm ducts/65mm G.I. Pipe in footpath include permanent reinstatement and backfill material		
2	FRP Cover Size	510 X 510 X35 mm as per EN 124:2004 for 12.5 MT load capacity		
3	Frame Size	Frame of size 620 (L) X 620(B)X 72 (W)		

1.1.32 Cables (8 core Cable and 16/14/12 core armored Cable)

The power cables are to connect each of the lamps on the poles from the traffic signal controller, generally for a starlight pole 6/8 core and for a cantilever pole 14/16 core cables are used. The cores are determined according to the no of lamps available on the pole. However, as a general best practice 8 Core is used for Straight pole and 16 cores is used for cantilever to keep the redundant cables available if in case of fault. The cables used shall be 650/1100 V Grade PVC /XLPE insulated PVC Sheathed Multicore copper conductor armored cable (single strand) as per the specification and As per IS 1554

S No.	Parameter	Specification	Compliance to Specifications (Yes/No)	Remarks
1	Cores	8 and 16 cores		
2	Insulation type	PVC/XLPE		
3	Size	1 or 1.5 Sq mm		
4	Strands	Single		
5	Conductor	Copper		

1.1.33 Controller foundation

The PCC foundation plinth on which the controller is erected on the sideways of the junction is called the foundation. The controller foundation shall be up to 600mm height above ground level and 600 mm below ground level on C.C. M20 grade pedestal, having size (LXBXH) with fixing of SS304 nut bolts for controller cabinet & Power supply box cabinet. The nut & bolts shall be properly tightened. The neoprene gaskets shall be provided between the foundation & controller for proper fittings if required. The washers of proper size with spring type of washers shall be

provided for fittings. The earthing points shall be properly joined & shall be tight enough. The cable entries shall be through the cable glands & the glands shall be properly filled.

1.1.34 Field On-Line UPS/DCPS:

Every junction shall have a power back arrangement (Min. 2 hrs.) for the smooth functioning of the signal even at time of power shortage

S.No	Particular	Technical Specification	Compliance to Technical Specifications (Yes/No)	Remarks
1.	Capacity	2.5/3 KVA		
2.	Technology	IGBT based PWM Technology, True Online UPS/DCPS		
3.	Input Frequency Range	Preferably 45 to 55 Hz		
4.	Output Frequency Range	Preferably 45 to 55 Hz		
5.	Output Voltage	230VAC/12VDC/24VDC		
6.	Voltage Regulation	Preferably +/- 2% (or better) and with built in Over Voltage Cut off facility in the Device		
7.	Frequency	Preferably 50 Hz +/- 0.1% (free Run Mode)		
8.	Battery Backup	Minimum 2 hrs backup		
9.	Battery Type	Preferably Lead acid, Sealed Maintenance Free (SMF)		
10.	Alarms & Indications	All necessary alarms & indications essential for Performance monitoring of UPS like mains fail, low battery & fault detection		
11.	Bypass	Automatic, Manual Bypass Switch		
12.	Certifications	For Safety & EMC as per international standard		

1.1.35 Automatic Number Plate Recognition (ANPR) & Evidence Camera

ANPR Cameras are capable of recording the number plates of the vehicles passing by its Field of view (FOV). These shall be strategically placed in junctions and on the streets in such a way that they are capable of capturing the vehicle number plates which are violating the traffic rules such as Red light, stop line, no helmet, speed and wrong direction based on the backend analytics configured. The evidence camera shall at the same time of generation of the violation snap shall capture the point of violation covering a wider FOV. The minimum specification of the cameras to be used is as below.

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

12	Local storage	Minimum 64 GB Memory card in a Memory card slot. In the event of failure of connectivity to the central server the camera shall record video locally on the SD card automatically. After the connectivity is restored these recordings shall be automatically merged with the server recording such that nonmanual intervention is required to transfer the SD card-based recordings to server		
13	Protocol	IPV4/IPV6, HTTP, HTTPS, FTP/SMTP, RTSP, RTP, TCP, UDP, RTCP, DHCP, UPnP, NTP, QoS, ONVIF Profile S & G		
14	Security	Password Protection, IP Address filtering, User Access Log, HTTPS Encryption		
15	Casing	NEMA 4X / IP-66, IK10 rated		
16	Intelligent Video	Motion Detection & Tampering alert		
17	Alarm I/O	Minimum 2 Input & 1 Output contact for 3rd party interface		
18	Certification	UL/EN/BIS, CE, FCC		

1.1.36 Infra-Red (IR)- Illuminators

The IR-Illuminator shall be the source of the light to the ANPR and the evidence cameras during the low light conations. the minimum specifications are as listed below

S. No	Particular	Technical Specification	Compliance to Technical Specifications (Yes/No)	Remarks
1.	IR Technology	Continuous Variable Angle Technology		
2.	FOV Angel Range	10° ~ 180		
3.	Adjustable Beam Angle	Up to 100 Meters		
4.	LED Wavelength	850nm		
5.	External Input	IR ON/OFF control		

6.	External Output	Day/Night switching		
7.	Automatic IR On/Off	Controlled by Light Sensor		
8.	Power Input	12~24V DC ±10%		
9.	Power Consumption	Max. 48W		
10.	Operating Temperature	-40 °C ~ +60 °C		
11.	Working Temperature	-50 °C ~ +60 °C		
12.	IP rating	IP 66		

1.1.37 Local Processing Unit (LPU)

LPU shall be the core functioning unit for the enforcement system on the field, the same shall have a storage for local processing the images of the vehicles being captured and pushing it to the central system in real time as per the demand. The minimum specifications are as below

S. No.	Functional Specification	Compliance to Functional Specifications (Yes/No)	Remarks
1.	The LPU shall be installed at the location level in IP 55 enclosure with Sunshield, vandal proof casing		
2.	The system should run on outdoor, industrial grade multi core processor-based server and should be able to cover at least 8 lanes. Some important specifications are as follows: Intel multi core latest generation processor i7 16GB RAM minimum 4TB rugged grade hard disk (support up to 70° centigrade operating temperature) 128GB SSD for operating system Fan less design The entire unit should be capable to perform under overall operating temperature of minimum 70 deg.		

1.1.38 Field Network Switch

The network switch shall be defined in such a way that the enforcement cameras, traffic controller and the UPS/DCPS shall be connected to the same to be accessed at the control room. The minimum specification is as below

S No.	Parameter	Minimum Specifications or Better	Compliance to Technical Specifications (Yes/No)	Remarks
1	Type	Managed Outdoor Industrial grade switch with Industrial Grade power supply (AC/DC)		
2	Total Ports	4 ports of 10/100-TX, PoE/PoE+, 2x SFP Ports; As per site requirements at certain locations 8 ports might be needed • 4xSFP ports • Higher density ports; and • Fiber ports		
3	PoE Standards	IEEE 802.3af, at or better		
4	Protocols	IPv4, IPv6, Support 802.1Q VLAN, DHCP support, IGMP, SNMP Management, Loop protection and Loop detection support, Ring Protection support, End point authentication, NTP support		
5	Access Control	Support port security, Support 802.1x (port-based network access control), Support for MAC filtering		
6	PoE Power per port	Sufficient to operate edge devices connected including VMBs & PAS		
7	Enclosure Rating	IP 30 or equivalent Industrial Grade Rating (to be housed in Junction Box)		
8	Operating Temp	0 to 50 deg C or better industrial Grade Rating		
9	Multicast Support	IGMP Snooping V1, V2, V3; MLD Snooping V1, V2		
10	Management	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	Certification	UL/EN/IEC or equivalent		

1.1.39 Solar Flashing Blinker with pole and all accessories

Solar flashing beacons/blinkers are used to alert the incoming vehicle about the approaching intersection at any point and to slow down and move carefully. Flashing beacons/blinkers are proposed at junctions which are more prone to accidents, school zones, etc. and has less traffic flow. Solar based blinker is being proposed and the basic components associated with the blinkers areas listed below:

S.No	Particular	Technical Specification	Compliance to Technical Specifications (Yes/No)	Remarks
1.	Blinker Controller	Blinker Controller with adjustable flash rate having an interface to a solar panel of 12 Volts D.C. supply with sufficient power rating with a battery charge regulator		
2.	Solar Panel	12V,75Watt or 12V,100 Watt		
3.	LED	Amber/RED		
4.	Battery	12V,75 AH or 12,100AH		
5.	Battery Cabinet	Appropriate cabinet for housing the battery		
6.	Pole	6 Mts Pole with solar panel mounting brackets and Battery stand		

The above-given specification is of conventional types, However, the new generation blinkers need an only solar panel and pole to function rest all are incorporated in to on single LED Housing (i.e LED retrofit itself will have the battery and the blinker controller housed within it.)

1.1.40 Traffic Command & Control Center

a. Workstations

The workstations are the day to day activity center for the operators monitoring the Traffic and Enforcement related duties. Industrial grade 4 workstations with 2 monitor setups has been proposed. The minimum specification is as listed below

S.No	Parameter	Minimum Specifications or Better	Compliance to Specifications (Yes/No)	Remarks
1	Processor	Should be supplied with latest 64bit x86 Xeon / core i9 or higher processor for workstations		
2	Chipset	Latest series and OEM Motherboard		
3	RAM	Min. 16 GB DDR3 Memory @ 1600 MHz. Additional slots for future upgrade		
4	Graphics Card	Min. Graphics cards with 2 GB video memory (non shared)		
5	HDD	2 TB SATA-3 Hard drive @ 7200 rpm		
6	Network Interface	10/100/1000 Mbps autosensing on-board integrated RJ45 Ethernet port		
7	Audio	Line/Mic IN, Line-out/Speaker Out (3.5mm)		
8	USB Ports	Min. 6 USB ports with 2 USB ports in the front		
9	Keyboard & Mouse	OEM Keyboard with min. 104 keys and 2 button optical scroll mouse (USB)		
10	Monitor	Min. 21.5/22" TFT LED monitor, Min. 1920 x 1080 resolution, 5 ms or better response time, TCO 05 or higher certified; 2 LED monitors attached to the same workstation (multi-monitor)		
11	Operating System	64-bit pre-loaded OS with recovery disc		
12	Security & Antivirus	BIOS controlled electro-mechanical internal chassis lock for the system Advanced antivirus, antispyware, desktop firewall, intrusion prevention system managed by a central server; Software upgrades throughout the contract period		

13	Power Supply	SMPS – 90% efficient with EPEAT Gold Certification for the system		
14	Certification	Energy star 5.0/BEE star certified		

b. Videowall and Controller Workstation

Video wall for CCC

Sl. no.	Specification	Compliance to Specifications (Yes/No)	Remarks
1.	Video Wall, Controller, Cube & Wall management software should preferably be from same OEM for ensuring smooth operations and seamless integration and feature enablement and enhancement.		
2.	All licenses of the software supplied with Controller and Video Wall should be with perpetual license and cost of the same should be included in the quoted cost.		
3.	The Videowall solution should be supplied with all necessary accessories not limited to but Including HDMI, DVI Fiber optic connector for display cables, display cables etc.		
4.	The solution should be supplied with 5 yr comprehensive warranty with NBD support.		

Video wall display panels

Sl. no.	Specification	Compliance to Specifications (Yes/No)	Remarks
1.	**Technology-** Should have IPS LED display with direct LED backlight.		
2.	**Screen size-** Should be of 45/50 inch diagonal size		
3.	**Resolution-** Should be of Full HD resolution (1920 X 1080)		

Sl. no.	Specification	Compliance to Specifications (Yes/No)	Remarks
4.	**Brightness-** Should be > 350 Nits		
5.	**Contrast-** 5000:1 or better		
6.	**Viewing angle-** 178/178 (H/V) or better		
7.	**Wall uptime/ Lifetime-** 50000 hours or better		
8.	**Interface-** 2 x HDMI or higher		
9.	**Bezel size-** less than 5 mm		
10.	**Mount-** Should be wall mountable		

Video wall display panels

Sl. No.	Specification	Compliance to Specifications (Yes/No)	Remarks
1.	**Processor-** Should be supplied with latest 64bit x86 processor or better.		
2.	**OS-** Should be supplied with preloaded 64bit compatible latest version OS.		
3.	**RAM-** 16 GB DDR3 ECC RAM		
4.	**HDD-** 2 x 1 TB 7200 RPM SATA HDD (configured in RAID 0)		
5.	**Storage Controller-** Should support RAID 0,1,5 levels		
6.	**Network-** Should be supplied with 2 x 1000/100/10 RJ 45 Ethernet port		
7.	**I/O ports-** DVI/HDMI/USB/ LAN/ VGA port		
8.	**Keyboard-** Should be supplied with 104 key USB keyboard		

Sl. No.	Specification	Compliance to Specifications (Yes/No)	Remarks
9.	**Mouse-** Should be supplied with two button scroll USB mouse		
10.	**Video Inputs-** Should be supplied and configured with 4 video inputs		
11.	**Video Outputs-** Should be supplied and configured with 4 video outputs		
12.	**Cables-** Should be supplied with necessary cables for connecting to display panels and input source.		

Video wall controller

Sl. No.	Specification	Compliance to Specifications (Yes/No)	Remarks
1.	**Input Management-** All input sources can be displayed on the video wall in freely resizable and movable windows.		
2.	**Control functions-** Brightness/ Contrast/ Saturation/ Hue/Filtering/ Crop/ Rotate.		
3.	**Display & Scaling-** Display multiple sources anywhere on display up to any size. Display multiple source windows in any size, anywhere on the wall.		
4.	**Scenarios management-** Save and Load desktop layouts from Local or remote machines.		
5.	**Layout Management-** Support all Layout from Input Sources, Internet Explorer, Desktop and Remote Desktop Application.		
6.	**Multi View Option-** Multiple view of portions or regions of Desktop, Multiple Applications view from single desktop		
7.	**Miscellaneous-** Remote Control over LAN, Multiple concurrent client, Graphical User Interface, Health		

Sl. No.	Specification	Compliance to Specifications (Yes/No)	Remarks
	Monitoring, Remote management, KVM Support.		

c. Server & Storage

1.1.41 Minimum Specification for the servers

Sl. No.	Parameter	Specifications	Compliance to Specifications (Yes/No)	Remarks
1	Processor	The Server should be capable of having 2 processors each with 20 cores or higher and should be populated with two numbers of latest generation x86_64bit x86 processors		
2	Architecture	The compatible chipset for the above processors. The server should be configured with node controller or equivalent technology for better performance and scalability		
3	Memory Configuration	The Server should be configured with 96 GB DDR3 ECC RAM expandable upto 1 TB		
4	Memory Protection	Advanced ECC memory protection, Memory mirroring/Online Spare Memory or Equivalent		
5	RAID Controller	The Server should be configured with internal Serial Attached SCSI (SAS) RAID controller and support RAID 0, 1, 5 and 6		
6	HDD Bays	The server should be supplied with 2 numbers of 300 GB SSD drives configured with RAID 1 redundancy.		
7	Failure Alerting Mechanism	The Server should be able to alert impending failures on maximum numbers of components. The component covered under alerting mechanism should at least include processors, memory and Hard disk drives.		
8	PCI Slots	Minimum 10 PCI-E slots or higher PCI Adapters / Interfaces		
9	FC connectivity	The server should be configured with two 32 Gbps FC ports.		
10	Network ports	The Server should be configured with 4 x 1 Gbps Ethernet Ports		

11	Power Supply & Cooling system	Redundant hot pluggable Power Supply as per OEM standard with redundant hot pluggable fan kit. system should be running even if 50% of the power supplies (any combination of power supplies amounting to 50% of the total) fail simultaneously		
12	Manageability software	Server Manageability software as per manufacturing standard of OEM, for monitoring and Managing the server.		
13	Industry Standard Compliance	ACPI 2.0. Compliant; PCIE 2.0 Compliant; PXE Support; WOL Support; Physical Address Extension (PAE) Support; Microsoft® Logo certifications; USB 2.0 Support		
14	Form Factor	Rack mountable		
15	OS support	The server should support all these o/s and related software. Microsoft Windows Server; Microsoft Windows Server Hyper V Red Hat Enterprise Linux (RHEL); CENTOS SUSE Linux Enterprise Server (SLES); VMware		
16	Accessories	The server should be supplied with all necessary accessories like power cables, network cables with supported termination for the proposed switches in 10G speed etc		
17	Warranty	5 years 24x7 support with commitment to resolve the problem within 6 hours directly from the OEM		

1.1.42 Storage

Sl No.	Description	Compliance to Specifications (Yes/No)	Remarks
1.	Storage offered should be enterprise class storage		
2.	Storage should provide usable capacity of 5 TB usable with RAID 6 configuration and should be scalable.		
3.	Storage shall be of NLSAS & SSD in ratio of 90:10		
4.	Storage should support all industry-leading operating system such as Windows server 2008 and above, Suse Linux, ubuntu, centos, RHEL etc and any Hypervisors such as VMWare, Hyper-V, KVM, RHEV, Xen etc., Any software license required		

Sl No.	Description	Compliance to Specifications (Yes/No)	Remarks
	to connect these OS with the storage in multipath must be part of the proposal		
5.	Proposed Storage System should support minimum 8000 volumes		
6.	The Storage Array shall be supplied with hot swappable, active-active redundant, minimum of dual Crossbar Engines / dual controller node / dual controller engine or equivalent and shall be scalable to at-least 4 Crossbar engines / Controller nodes		
7.	Proposed storage must be capable of hot swapping of all components like disk, cache, power supply units, cooling fan units, etc., with no disruption to any application. There should be no service degradation and/or data loss for such an activity		
8.	Storage should support all industry standard RAID configuration such as 10, 5 and 6 or better levels with dual or higher parity		
9.	Offered storage shall have the shared/global hot spare feature. Minimum 5% of usable capacity of the storage should be used as hot spare.		
10.	Cache shall be battery backed/ disk de-staged. And shall be capable to provide data protection.		
11.	In the event of power failure data in cache shall be safely written to disks prior to performing a graceful shutdown		
12.	Even in case of natural calamities Data loss in Storage should be zero		
13.	Storage should support FC for Front-end host connectivity		
14.	Controllers should be in active-active mode		
15.	Storage should support major industry standard protocols like FC, iSCSI or equivalent, for offered storage capacity. If any additional components are required, it should be supplied without additional cost and configured in such a way as there is no single point of failure.		

Sl No.	Description	Compliance to Specifications (Yes/No)	Remarks
16.	Data path should be consistently active-active and not hot standby		
17.	The Storage array shall be supplied with minimum of 4 x 16 Gbps FC ports per controller.		
18.	The Storage array shall have end-to end 12Gbps enabled which means that both Front-end Fiber channel ports and Back-end engines shall be operated at minimum 12Gbps speed.		
19.	Storage should have minimum 2 additional 10G native IP Ports for storage-based replication and shall be scalable to 4 10G native IP ports		
20.	Storage array should support multi-pathing across controllers		
21.	Storage controller should support automated I/O path failover		
22.	Storage array should support volume movement across different storage controller to enable zero downtime during online server migration from one controller pair to another		
23.	All upgrade to controllers, such as firmware . BIOS, Clone, Snapshot, remote mirroring and management software, etc., should be seamless and shall be carried out without any disruption / downtime to production. Attached hosts must remain fully operational during such upgrades		
24.	Storage should support Thin and Thick provisioning, Point in Time Snapshot, De-duplication, compression, encryption, QoS and Management. All necessary licenses should be active from day one.		
25.	storage should allow online expansion of the existing RAID groups / Storage Disk pools without any downtime		
26.	Any upgrade carried on should not result in performance degrade, OEM should make provision of appropriate components to address such issue without any additional cost.		
27.	The supplied storage should be capable of 3-way replication.		
28.	The storage should be capable of selective volume groups replication		

Sl No.	Description	Compliance to Specifications (Yes/No)	Remarks
29.	The storage system should be able to do data de-duplication and compression either separately or both for the specific LUNs		
30.	Storage system should have the requisite license to create point in time snapshots. The license supplied should be for the entire capacity of the storage.		
31.	Proposed storage must include single, easy to use CLI,GUI and web-based storage management software, to centrally manage all storage subsystem of same family		
32.	Proposed storage must provide automatic monitoring of disk drive health and initiate proactive background drive build on spare drives.		
33.	GUI/Web based management tool must be capable to configure all features, monitor the status and health of storage system from day one. All required licenses to be included		
34.	The performance monitoring should be real time and historical providing IOPS, response time and utilisation of individual components within the storage array, the tool should have capability to analyse, predict the configuration, data path etc for performance, bottleneck and make recommendation to improve the storage performance and utilization. It should also analyse, predict and recommend the configuration change / modification for majority of workloads associated to proposed storage.		
35.	Log maintenance facility should be available		
36.	storage should be compatible to integrate with third party monitoring tool		
37.	5 years comprehensive, onsite support warranty including part replacement/repairs within 6 hours of reporting, and software support for updates, upgrades, patches and bug fixes for supplied software from OEM 24X7 365 days. SSD drives should be covered for irrespective of read/writes on them. In case disk failure the faulty disk will be returned only after degaussing. Proactive storage monitoring and support from OEM should be enabled. The proposed bidder will need to ensure support of product and change of components at zero cost in case of any part becoming obsolete.		

Sl No.	Description	Compliance to Specifications (Yes/No)	Remarks
38.	Storage shall be supplied with all software license in perpetual for full capacity of the storage from day one. There should be no additional software cost while replacing the storage within the same class. And all desired functionalities will work throughout the life cycle of storage without additional cost.		
39.	Storage should have license for instant creation of clones of active data, with near zero impact		
40.	The software offered should be enterprise version and should be from same OEM		
41.	The storage should be configured with QoS feature for IOPS and Throughput and latency		
42.	All required cables and connectors to be supplied by the bidder.		

1.1.43 SAN Switch

Sl.No.	Parameter	Description	Compliance to Specifications (Yes/No)	Remarks
1	Ports	The SAN Switch shall be configured with minimum 24 FC Ports.		
		12 ports to be activated and licensed.		
		Required scalability shall not be achieved by cascading the number of switches and shall be offered within the enclosure only.		
		Should deliver line rate non-oversubscribed FC port speeds of 16 Gbps with backward compatibility of 8Gbps in non-blocking architecture in an energy efficient fashion.		

		SFP Optics quantity of 12 numbers of 16Gig FC MM SFP should be supplied along with each switch.		
2	Form factor	The switch should be rack mountable.		
3	Management	Proposed SAN switch (or through a solution) should support FC/SAN analytics including the ability to export the analytics data to third party monitoring software. All the license and/or appliance should be supplied with license from day one		
		Switch shall have support for web-based management and should also support CLI		
		The switch should have USB port for firmware download, support save, and configuration upload/download.		
		Switch shall support POST and online/offline diagnostics, Fcping and Path info (FC Traceroute), port mirroring (SPAN Port), Internal loopbacks, Syslog, FC debug, online system health		
4	QoS	Offered SAN Switch shall support services such as Quality of Service (QoS) to help optimize application performance in consolidated, virtual environments. It should be possible to define		
		SAN switch shall support to restrict data flows from less critical hosts at preset bandwidths		
		high, medium and low priority QoS Zones to expedite high-priority traffic.		
		It should be possible to isolate the high bandwidth data flows traffic to specific ISLs by using simple zoning		
5	Miscellaneous	Offered SAN Switch shall support to measure the top bandwidth consuming traffic for a specified port or a fabric which should detail the physical or virtual device		
		The Switch shall provide Redundant and hot swappable power supplies and should be platinum certified.		

		All relevant licenses need to be included from day one		
		All the cables, connectors, accessories required for the complete functioning of the equipment should be provided from the day one.		

d. Core switch

Sl.No.	Parameter	Description	Compliance to Specifications (Yes/No)	Remarks
1	Switch Architecture and Performance	Line-rate support for 1, 10 and 40 GbE to satisfy current and future needs Switch must have minimum 1,2 Tbps Switching capacity Switch must support latency of 850ns or less Switch must support IPv4 and IPv6 switching and routing in hardware from day 1 Packet forwarding performance of up to 500 Mpps Redundant PSU (both AC and DC supported) and Fan Tray. must be hot swappable		
2	Ports	Minimum of 24×1/10 G SFP+		
3	Layer 2 features	Support for minimum 75 K MAC addresses system wide, Minimum 30k Arp entries support, The switch should support Multi-Chassis LAG or equivalent must support VLAN Trunk Protocol (VTP) or equivalent that reduces administration in a switched network. When one configures a new VLAN on one VTP server/ Equivalent, the VLAN should be distributed through all switches in the domain. Must support UDLD or equivalent. Support for traceroute over tunnel to provide overlay reachability information in an overlay tunnel over IPV4 and IPV6 networks. BPDU Guard, BPDU Filter, PVST+, MST, RSTP Must support snmp and syslog Notification for MAC addition, deletion and movement across ports Must Support CDP/ LLDP for discovery of neighbors		

4	Layer 3 features	Support for IP Unicast routing protocols (static,OSPF, BGP) on IPV4 and IPV6 Support for HSRP / VRRP or equivalent from day 1 for IPV4 and IPV6 Multicast routing protocol with PIM-SM The switch should support minimum of 10K IPv4 routes The switch should support a minimum of 3K IPv6 routes Support for 2K VXLAN tunnels The switch should support 6K ACL's Support for OSPF-NSR and BGP-GR Should support BFD for Static Routing, OSPF		
5	QoS	must support ACL qos, port based qos, Flow based Qos, Acl based Rate limit, ACL based sflow Must support strict priority, WRR, SP+WRR Switch must support eight hardware queues per port.		
6	Security	Switch must support port security, SCP, SSHv2, 802.1x, TACACS+ Should support FIPS or EAL3 Support for RA Guard		
7	Virtualization support	Should support Data Center Bridging eXchange (DCBX)/FCoE must support Automatic Migration of Port Profiles with VM-aware Network Automation must support SDN with Openflow 1.3 protocols for open architecture Network Virtualization Using VXLAN (RFC 7348) from day one. Switch must support IP Fabric or similar Must support native integration with VMWare		
8	Management	Must support ISSU for L2 and L3 Must support scheduled archiving / uploading of configuration and system log to a central server Switch must support ASIC based Flow monitoring like Netflow / sFlow Support for SPAN and RBAC Must be manageable by SNMP , CLI and Netconf Support for RFC 2460, 2464		

e. Network rack

S. No.	Specifications	Compliance to Specifications (Yes/No)	Remarks
1	Should adhere to EIA 310D/DIN 41494 or equivalent ISO standards		
2	Should adhere to safety standards of UL 60950-1/ROHS		
3	19" mountable standard racks		
4	Height 42U, width min 800 mm and depth min 1200 mm		
5	800+ KG's of static loads		
6	Front glass door, closed on all sides, lock and key		
7	Top and bottom cover with cable entry provision along with ventilation		
8	Cable Manager's along with duct		
9	Should be compatible with all the other equipment		
10	Should be supplied with the necessary PDUs		
11	The PDUs should be supplied with the power surge protecting features		
12	The equipment should be from the OEM of the Servers.		

f. Central traffic management software with ATCS

The overall monitoring and process related to the traffic signaling is done on this platform, this platform shall be a user-friendly GIS based GUI. The platform works either in line with ATCS algorithm if the proposed system is of ATC/VAC mode or shall work independently in fixed modes of operations.

In fixed mode of operation, the management software shall only help in view the status, access the individual junction and actuate the basic functionalities such as switch off, forced flash, time change etc. and keep track of the logs. The junctions shall work according to the time of the day and the cycle lengths that has been pretimed into the controller. There shall not be any real-time adaptation being initiated by the central traffic software.

The same when operated with ATC algorithm/software shall collect the real-time data fed from the vehicle detection cameras and shall process the same to change the cycle times of the junction or the corridor as per the demand. There is no manual intervention required as the corridor or junction shall adapt itself to the time demand of the hour vide the ATCS/AC mode.

The minimum functional specification is listed below.

S.No	Functional Specification	Compliance to Specifications (Yes/No)	Remarks
1	This software shall be deployed and configured at data centre or the designated server hub of KSCCL/Traffic CCC. The traffic signal system shall work on the Fixed Time control mode which set the signal cycle timing based on peak and non-peak hour of junction.		
2	The application shall be capable to cater to adaptive traffic control strategic based on the future requirement of the city.		
3	The application shall be able to gather the data from the vehicle detector irrespective of detection technology.		
4	The application shall have component that develop appropriate stage timing plans for each approach of every intersection under the Traffic Signal System, based on real time demand.		

5	The application shall communicate with traffic signal controller and propose time plans to every intersection under the Traffic Signal System in every cycle.		
6	The application shall have database which maintain time plan execution and system performance.		
7	The application shall record all error logs and system logs and generate reports.		
8	Graphically present signal plan execution and traffic flow at the intersection		
9	Graphically present time space diagram for selected corridors		
10	The traffic signal system shall seamlessly integrate with central traffic management platform which shall generate all type of standard and custom report for planning and analysis		
11	The application shall generate alerts to the operator that trigger on customizable conditions in the network		
12	The application shall create a traffic data warehouse for all historic traffic information gathered from the hardware installed on the road network.		
13	Network Status Display – This online display shall indicate with appropriate color-coding on-site map whether an intersection under the Fixed Time Mode. On double clicking the intersection, a link shall be activated for the traffic flow display for the intersection.		
14	Traffic Flow Display – This online display shall indicate the current traffic flow with animated arrows, mode of operation, stage number being executed and elapsed stage time.		
15	Saturation Snapshot – This display shall show the current saturation levels of all intersections in a corridor.		
16	Time-Space Diagram – The time-space diagram shall display the current stages being executed at every intersection in a corridor with immediate previous history		
17	Currently running stage and completed stages shall be identified with different colors.		
18	Stages identified for synchronization shall be shown in a different color.		
19	The system shall have other graphical interfaces for configuring the Traffic Signal System, as appropriate.		

g. Traffic Enforcement analytics and software

The traffic rule violations such as red light, stop line, no helmet, speed and wrong way violations shall be captured by the ANPR cameras of the field and shall be sent to this platform for further process and OCR conversion and issuance to the challan system .The minimum functional specification is as listed below:

S.No	Functional Specification	Compliance to Specifications (Yes/No)	Remarks
1	The ANPR System shall enable monitoring of vehicle flow at strategic locations/junction intersection of the city.		
2	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.		
3	The system usage shall be privilege driven using password authentication.		
4	The system shall detect the color of all vehicles in the camera view during daytime and label them as per the predefined list of configured system colors. The system shall store the color information of each vehicle along with the license plate information for each transaction in the database.		
5	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		
6	The system should have option to input certain license latest according to the hot listed categories like “Wanted”, “Suspicious”, “Stolen”, etc by city authority. The system should be able to generate automatic alarms to alert the ICCC room personnel for further action, in the event of detection of any vehicle falling in the hot listed categories		
7	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		

8	The system shall enable easy and quick retrieval of snapshots, video and other data for post incident analysis and investigations.		
9	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.		
10	Report of vehicle flow at each of the installed locations for Last Day, Last Week and Last Month.		
11	Report of vehicles in the detected categories at each of the installed locations for Last Day, Last Week and Last Month.		
12	Report of Vehicle Status change in different Vehicle Categories.		
13	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.		
14	The system shall have option to export report being viewed to common format for use outside of the ANPR or exporting into other systems.		
15	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 using Artificial Intelligence and Machine Learning algorithms.		
16	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".		
17	System should have option to specify maximum time to retain vehicle records in specific categories.		
18	The system should be capable of generating proof of traffic rule violation through video (+ and – 5 seconds of the violation) and minimum 5 snapshots in any of the standard industry formats (MJPEG, JPG, AVI, mp4, mov, etc)		
19	The system should be able to perform ANPR on all the vehicles passing the site and send alert on detection of any hot listed vehicle. The system should have ANPR/ OCR to address the alpha numeric character of irregular font size.		
20	The system should have function of quickly searching the number plate based on the following criteria:		
	• Full or partial number of the license plate,		
	• Color of the vehicle,		
	• Classification of vehicle,		

	• Junction/Location Name\ Event Violation Type		
21	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.		
22	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: ·		
	• Type of Violation		
	• Date, time, Site Name and Location of the Infraction		
	• Registration Number of the vehicle through ANPR Camera system for each vehicle identified for infraction		
23	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		
	• When it violates the stop line.		
	• When it violates the red signal.		
	• Besides, a closer view indicating readable registration number plate patch of the violating vehicle for court evidence for each violation.		
24	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. The entire evidence should be watermarked and encrypted to stand the court of law.		
25	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.		
26	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 color of the Traffic light at the instant of Infraction even if any other means is being used to report the color of the light.		
27	The system should interface with the traffic controller to validate the color of the traffic signal reported at the time of Infraction so as to give correct inputs of the signal cycle.		

28	The Evidence and ANPR camera should continuously record all footage in its field of view to be stored at the local base station. This should be extractable onto a portable device as and when required. The option of live viewing of evidence cameras from the locations shall be available at the ICCC. Necessary license shall be available in ICCC to see the live feed of evidence camera.		
29	The recording and display of information should be detailed on the snapshot of the infracting vehicle as follows: • 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 • Type of Violation (Signal/Stop Line) • Lane Number of violating vehicle • Time into Red/Green/Amber • Registration Number of violating vehicle		
30	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 solution should allow for viewing, sorting, transfer & printing of violation data through integration with existing E-challan system in ICCC.		
31	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.		
32	Violation retrieval could be sorted by date, time, location and vehicle registration number and the data structure should be compatible with Police database structure. It should also be possible to carry out recursive search and wild card search		
33	The evidence of Infraction should be encrypted and protected so that any tampering can be detected		
34	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		

35	System shall use open standards and protocols to the extent possible and declare the proprietary software wherever used.		
36	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.		
37	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).		
38	The Speed Violations should be automatically detected by the system by using appropriate non-intrusive technology		
39	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.		
40	The violation detection shall be detecting the spot/average speed of vehicle up to 150 Kmph +/-5% based on the class of vehicle and generate red flag if it's beyond the pre-set limit.		
41	The capture of speed violation detection system shall be done through the same evidence camera that used for stop-line and red-light violation detection.		
42	The algorithm shall be accurately detecting the speed and generate the violation record in backend system.		
43	The local processing unit shall be integrated with Smart Junction component in way that it shall create better use cases for citizen to achieve the objective.		
44	The system should integrate with Telangana police e-challan system and post all the generated/approved challans into the e-challan system.		