



Procurement of

Design, Supply, Installation, Commissioning, Operations and Maintenance
of Intelligent Transportation Systems
in Chennai Metropolitan Area

(8th March 2022)

ADDENDUM - 1

Employer: Chennai Smart City Limited

Country: India

Project: Installation of Chennai Metropolitan Area Intelligent Transport Systems

JICA Loan No.: ID-P270

Procurement of Design, Supply, Installation, Commissioning, Operations and Maintenance of Intelligent Transportation Systems in Chennai Metropolitan Area
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1.	1	IFB-1	Invitation for Bids	6	Bids must be delivered to the address above on or before [15:00 PM] on [18th January 2022] and must be accompanied by a Bid Security of INR 10 Crores (equivalent USD 1.35 million).	Bids must be delivered to the address above on or before [15:00 PM] on [22 nd April 2022] and must be accompanied by a Bid Security of INR 100 Million or equivalent in USD.
2.	1	IFB-2	Invitation for Bids	7	Bids will be opened in the presence of Bidders' representatives who choose to attend at [15:30 PM 18th January 2022] at the office of:	Bids will be opened in the presence of Bidders' representatives who choose to attend at [15:30 PM 22 nd April 2022] at the office of:
3.	1	BDS-1	Section II- Bid Data Sheet	ITB 4.1	The letter of intent will not be considered. The Bidder should execute and submit Joint Bidding Agreement for JV as per format attached in Bidding Forms.	A Bidder may be a firm that is a single entity or any combination of such entities in the form of a joint venture or consortium (hereafter referred as JV) that shall be executed by JV Agreement as per the format attached in Bidding Forms. In the case of a JV: (a) all members shall be jointly and severally liable for the execution of the Contract in accordance with the Contract terms, and (b) the JV shall nominate a Representative who shall have the authority to conduct all business for and on behalf of any and all the members of the JV during the bidding process and, in the event the JV is awarded the Contract, during Contract execution. (c) maximum number of members accepted in joint venture (JV) is Four (4), provided the JV as a whole meets all the criteria mentioned in the bid document.
4.	1	BDS-1	Section II- Bid Data Sheet	ITB 21.7		The Bid Security of a JV shall be in the name of the Bidder (single entity) or all the names of all members stated in JV Agreement as per the format attached in Bidding Forms, that submits the bid.
5.	1	BDS-3	Section II- Bid Data Sheet	ITB 21.1	The amount and currency of the Bid Security shall be INR 10 Crores (equivalent -USD 1.35 million).	The amount and currency of the Bid Security shall be INR 100 Million or equivalent in USD.
6.	1	BDS-3	Section II- Bid Data Sheet	ITB 24.1	The deadline for Bid submission is: Date: 18th January, 2022 Time: 15:00 PM.	The deadline for Bid submission is: Date: 22 nd April, 2022 Time: 15:00 PM.
7.	1	BDS-4	Section II- Bid Data Sheet	ITB 27.1	The Technical Bid opening shall take place at: Date: 18th January 2022 Time: 15:30 PM	The Technical Bid opening shall take place at: Date: 22 nd April, 2022 Time: 15:30 PM
8.	1	EQC-1	Section III Evaluation and Qualification Criteria	1.1.1	1.1.1 Personnel	Revised 1.1.1 Personal is enclosed as Annexure 1-1.
9.	1	EQC-6	Section III Evaluation and Qualification Criteria	1.1.3	1.1.3 Detail Evaluation (c) Bidders must achieve a minimum 80% marks (80 out of 100 marks). The bidder who does not achieve such minimum total points will be rejected.	1.1.3 Detail Evaluation (c) Bidders must achieve a minimum 75% marks (75 out of 100 marks). The bidder who does not achieve such minimum total points will be rejected.
10.	1	EQC-7	Section III Evaluation and Qualification Criteria	1.1.3	1.1.3 Detail Evaluation (1) Evaluation of Specific Technical Experience	Revised (1) Evaluation of Specific Technical Experience is enclosed as Annexure 1-2.

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11.	1	EQC-9	Section III Evaluation and Qualification Criteria	1.1.3	1.1.3 Detail Evaluation (3) Evaluation of Key Staff	Revised (3) Evaluation of Key Staff is enclosed as Annexure 1-3.
12.	1	EQC-18	Section III Evaluation and Qualification Criteria	2.4	2.4 Experience	Revised 2.4 Experience is enclosed as Annexure 1-4.
13.	1	BF-TOF1	Section IV. Bidding Forms	2.5	2.5 Subcontractors/manufacturers	Revised 2.5 Subcontractors/manufacturers is enclosed as Annexure 1-5.
14.	1	BF-16	Section IV. Bidding Forms	Schedule No. 2	Break Down of Price Schedule No. 2	Revised Break Down of Price Schedule No. 2 is enclosed as Annexure 1-6.
15.	1	BF-33	Section IV. Bidding Forms	Schedule No. 3	Break Down of Price Schedule No. 3	Revised Break Down of Price Schedule No. 3 is enclosed as Annexure 1-7.
16.	1	BF-83	Section IV. Bidding Forms	Form of Bid Security (Bank Guarantee)	At the request of the Applicant, we, as Guarantor, hereby irrevocably undertake to pay the Beneficiary any sum or sums not exceeding in total an amount of Ten Crores INR (10 Crores INR), Equivalent One million Three thousand and Five Hundred USD (1.35 million USD) upon receipt by us of the Beneficiary's complying demand, supported by the Beneficiary's statement, whether in the demand itself or a separate signed document accompanying or identifying the demand, stating that either the Applicant:	Revised Form of Bid Security (Bank Guarantee) is enclosed as Annexure 1-9.
17.	1	BF-85	Section IV. Bidding Forms	Form of Bid Security (Bid Bond)	BY THIS BOND [insert name of Bidder] as Principal (hereinafter called "the Principal"), and [insert name, legal title, and address of surety], authorized to transact business in [insert name of country of Employer], as Surety (hereinafter called "the Surety"), are held and firmly bound unto Chennai Smart City Limited as Obligee (hereinafter called "the Employer") in the sum of Ten Crores INR (10 Crores INR), Equivalent One million Three thousand and Five hundred USD (1.35 million USD), for the payment of which sum, well and truly to be made, we, the said Principal and Surety, bind ourselves, our successors and assigns, jointly and severally, firmly by these presents.	BY THIS BOND [insert name of Bidder] as Principal (hereinafter called "the Principal"), and [insert name, legal title, and address of surety], authorized to transact business in [insert name of country of Employer], as Surety (hereinafter called "the Surety"), are held and firmly bound unto Chennai Smart City Limited as Obligee (hereinafter called "the Employer") in the sum of One Hundred Millions INR (100 Million INR), or equivalent in USD [insert amount in words, (insert amount in figures)], for the payment of which sum, well and truly to be made, we, the said Principal and Surety, bind ourselves, our successors and assigns, jointly and severally, firmly by these presents.
18.	1	BF-86	Section IV. Bidding Forms	Form of Power of Attorney for Lead Member of JV	Form of Power of Attorney for Lead Member of JV	Revised Form of Power of Attorney for Lead Member of JV is enclosed as Annexure 1-8.
19.	1	BF-88	Section IV. Bidding Forms	Form of Power of Attorney for Authorised Representative	to do in our name and on our behalf, all such acts, deeds and things as are necessary or required in connection with or incidental to submission of our Proposal for Installation of Chennai Metropolitan Area Intelligent Transport Systems for [name of assignment],	to do in our name and on our behalf, all such acts, deeds and things as are necessary or required in connection with or incidental to submission of our Proposal for Installation of Chennai Metropolitan Area Intelligent Transport Systems,
20.	1	BF-90	Section IV. Bidding Forms	Form of Joint Bidding Agreement for JV	Form of Joint Bidding Agreement for JV	Revised Form of Joint Bidding Agreement for JV has been renamed as Form of JV Agreement which is enclosed as Annexure 1-10.
21.	2	ER-360	Section VIII	3.1.4	In case the delay is more than 3 weeks, the Employer reserves the right to encash the Performance Security towards the aforesaid penalty and may proceed with termination of the project, as the case may be.	In case the delay is more than 3 weeks, the Employer reserves the right to encash the Performance Security towards the aforesaid penalty.

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22.	2	ER-369	Section VIII	5.3.1	The maximum penalty applicable on quarterly applicable payment for not adhering to the SLA's is capped at 25% of the quarterly applicable payment proposed by the Contractor. However, the Employer along with CTP and MTC has an option to consider termination of the contract if the penalty exceeds 20% of the quarterly applicable payment for any two quarter in four consecutive quarters to the Contractor.	The maximum penalty applicable on quarterly applicable payment for not adhering to the SLA's is capped at 10% of the quarterly applicable payment proposed by the Contractor. However, the Employer along with CTP and MTC has an option to consider termination of the contract if the penalty exceeds 10% of the quarterly applicable payment for any two quarter in four consecutive quarters to the Contractor.
23.	2	ER-317	Section VII	5.1	Operating system: embedded Windows/Linux with programming software (Windows 7 or latest at the time of calling the tenders)	Operating system: embedded Windows/Linux/Android with programming software (Windows 7 or latest)
24.	2	ER-319	Section VII	7	During Operation & Maintenance stage contractor require to uninstall and reinstall the onboard device as required by MTC.	During Operation & Maintenance stage contractor require to uninstall and reinstall 1000 the onboard device as required by MTC.
25.	2	ER-330	Section VII	4	Content can include –Transportation Information (Bus schedules, alerts, etc.), safety information, localized community information, GPS driven localized data, Environmental data, advertising (still images, animation, video), tourist information.	Content can include – Transportation Information (Bus schedules, alerts, etc.), safety information, localized community information, GPS driven localized data, Environmental data, advertising, tourist information.
26.	2	ER-330	Section VII	4	PIS shall support alphanumeric, video, image, animations and graphics.	PIS shall support alphanumeric characters
27.	2	ER-305	Section VII	17	GPS location data shall be transmitted using a 3G/GPRS connection to the central system software within 1 minute for all the vehicles.	GPS location data shall be transmitted using a GPRS/3G/4G or latest connection to the central system software every 10 seconds for all the vehicles.
28.	2	ER-316	Section VII	175	The onboard computer shall send the current location report as determined by the GPS receiver over the 3G/GPRS network to the Central System, at an interval specified by the Employer. The Employer shall be able to choose a location report interval, with a minimum of 10 seconds.	The onboard computer shall send the current location report as determined by the GPS receiver over the GPRS/3G/4G or latest network to the Central System, at an interval specified by the Employer. The Employer shall be able to choose a location report interval, with a minimum of 10 seconds.
29.	2	ER-317	Section VII	5.1	<ul style="list-style-type: none"> ■ In built GPS and 3G(GSM) modules ■ WLAN ■ Combi antenna using RG174 cable. The connectors on Combi antenna will be preferably SMA(M) ST plug type for GPS and FME(F) jack type 1/4"-36UNS-2B for 3G 	<ul style="list-style-type: none"> ■ In built GPS and 3G/4G or latest (GSM) modules ■ WLAN ■ Combi antenna using RG174 cable. The connectors on Combi antenna will be preferably SMA(M) ST plug type for GPS and FME(F) jack type 1/4"-36UNS-2B for 3G/4G or latest
30.	2	ER-318	Section VII	5.1	(3) Technical specifications: 3G(GSM) modules ■ GSM/GPRS SMT quad band and UMTS (3G)	(3) Technical specifications: 3G/4G or latest (GSM) modules ■ GSM/GPRS SMT quad band and UMTS (3G)/4G or latest
31.	2	ER-313	Section VII	149	All reports must use standard reporting tools similar to Apache Spark, Hadoop, IBM IoT framework, Microsoft Azure, and have the ability to export data into file formats that can be exported to and edited with standard office software (e.g., Microsoft Word and Excel, Adobe Acrobat .PDF)	All reports must use stabilized COTS reporting tool and can export data into file formats that can be exported to and edited with standard office software (e.g., Word, Excel, PDF)
32.	2	ER-340	Section VII	79	All reports must use standard reporting tools similar to Apache Spark, Hadoop, IBM IoT framework, Microsoft Azure, and have the ability to export data into file formats that can be exported to and edited with standard office software (e.g., Microsoft Word and Excel, Adobe Acrobat .PDF)	All reports must use stabilized COTS reporting tool and can to export data into file formats that can be exported to and edited with standard office software (e.g., Word, Excel, PDF)
33.	2	ER-330	Section VII	4	All screens with paging data shall open and populate with the initial data in 3 seconds and thereafter page updates shall be retrieved within 1 second.	All screens with paging data shall open and populate with the initial data in 5 seconds and thereafter page updates shall be retrieved within 3 second.

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34.	2	ER-182	5.1 Controller/ Table 5-1: Hardware requirement of Controller	#9	■ Battery Voltage Monitoring	Deleted
35.	2	ER-171	Table 4-1: System Functional Requirements of ATCS Application	(3) Time of Day Control Function	Time of Day Control Function: Each Time of Day Schedule shall contain a minimum of 500 timetable events and an alphanumeric description. A single 'event' shall be taken to be a real time fully adaptive or fixed time command applied either to a single node or a group of nodes or an entire fully adaptive region or Sub-area.	Time of Day Control Function: Each Time of Day Schedule shall contain a minimum of 250 timetable events and an alphanumeric description. A single 'event' shall be taken to be a real time fully adaptive or fixed time command applied either to a single node or a group of nodes or an entire fully adaptive region or Sub-area.
36.	2	ER-173	Table 4-1: System Functional Requirements of ATCS Application	Displaying Function #6	The system shall be able to display the communication line status with appropriate colour coding on a map-based view.	The system shall be able to display the communication line status with appropriate colour coding on a GUI/map-based view.
37.	2	ER-186	5.3 Controller Cabinet Table 5-2	Table 5-2 #6	An intercom jack	Deleted
38.	2	ER-179	Table 4-2: Functional Requirement of Controller	Safety Operation #11	■ 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 fixed timing plan. On restoration of the communication with central computer the traffic signal controller shall automatically resort to adaptive mode.	■ Shall identify a communication failure with the central computer within a specified time period, the controller shall revert to the fall back mode of operation (highest priority mode as provided in ER 176, #5 within the controller's user defined configuration) after a user configurable time period. On restoration of the communication with central computer the traffic signal controller shall automatically resort to adaptive mode.
39.	2	ER-190	Table 5-7: Hardware requirement of Traffic signal pole	#13	■ Termination of signal cables may be brought to a terminal strip mounted within a pole- mounted box attached to the signal pole some 1.2 metres above ground level. Cables connected permanently in the signal heads shall also be brought through the inside of the pole into the termination box and terminated there. Earthing between the terminal and pole shall include terminal box door and internal connection arrangements. The termination box shall be rated to IP67 or better.	■ Termination of signal cables may be brought to a terminal strip mounted within a pole- mounted box attached to the signal pole some 1.2 metres above ground level. Cables connected permanently in the signal heads shall also be brought through the inside of the pole into the termination box and terminated there. Earthing between the terminal and pole shall include terminal box door and internal connection arrangements. The termination box shall be rated to IP65 or better.
40.	2	ER-192	Section 5.11 Table 5-9: Hardware requirement of Traffic signal aspect	#6	■ Power factor of the LED aspects shall be greater than 0.9	Deleted

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41.		ER-192	Section 5.11 Table 5-9: Hardware requirement of Traffic signal aspect	#9	■ 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. It shall be capable of withstanding winds of up to 180 km/h for 3 seconds. The colour of the signal body and visors shall be black UV stabilized high impact or impact modified Polypropylene. The lenses shall be acrylic, and reflectors shall be polycarbonate with stainless steel or Polypropylene fixings.	■ 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. It shall be capable of withstanding winds of up to 180 km/h for 3 seconds. The colour of the signal body and visors shall be black UV stabilized high impact or impact modified Polypropylene. The lenses and reflectors shall be polycarbonate with stainless steel or Polypropylene fixings.
42.		ER-193	Section 5.12 Table 5-10: Hardware requirement of Pedestrian pelican push button and buzzer	#2	<ul style="list-style-type: none"> ✓ Audio: Beep buzzer ✓ Working voltage: 12 Volts DC ✓ Body Material: Metal GI Powder coated. ✓ Push button shall be pole mounted as per IRC 	<ul style="list-style-type: none"> ✓ Audio: Beep buzzer ✓ Working voltage: 12/24 Volts DC ✓ Body Material: Metal GI Powder coated. ✓ Push button shall be pole mounted as per IRC
43.	2	ER-71	Section VI. General Requirements 21 Training	21.1 General	Contractor shall provide all training materials in both Word, PowerPoint, Excel and PDF formats, consisting of graphics, video and animations. The training and training material shall be made available in both Tamil and English.	<p>Contractor shall provide all training materials in both Word, PowerPoint, Excel and PDF formats, consisting of graphics, video and animations. The training and training material shall be made available in both Tamil and English.</p> <p>Contractor shall train 300 staff of the CTP and MTC, respectively before Trial Operation start. Subsequently, Contractor shall train around 50 staff of each user department every 3 to 6 months during the contract period.</p> <p>Contractor shall consider logistics (meeting room, food etc.) for 30 persons for 20 days.</p>
44.	2	ER-106	Section VII. Technical Requirements	7.1 System Server Architecture Table 7-1: Functional requirement of System server architecture -Server Virtualization for Primary and Secondary Servers	<ul style="list-style-type: none"> • Virtualization software should support live Virtual Machine migration between different generations of CPUs in the same cluster and without the need for a shared storage option. 	Deleted

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45.	2	ER-186 ER-214 ER-240 ER-256 ER-271	Section VII. Technical Requirements		<p>5.5 Industrial Grade Layer -2 Switch Table 5 3: Hardware requirement of Industrial grade Layer-2 switch</p> <p>5.4 Industrial Grade Layer -2 Switch Table 5-4: Hardware requirement of Industrial grade Layer-2 switch</p> <p>5.6 Industrial Grade Layer -2 Switch Table 5-5: Hardware requirement of Industrial grade Layer-2 switch</p> <p>6.5 Industrial Grade Layer -2 Switch Table 6-4: Hardware requirement of Industrial grade Layer-2 switch</p> <p>5.4 Industrial Grade Layer -2 Switch Table 5-3: Hardware requirement of Industrial grade Layer-2 switch</p>	Revised Industrial Grade Layer -2 Switch is enclosed as Annexure 2-17
46.	2	ER108	Section VII. Technical Requirements	<p>7.4 Security</p> <p>Table 7 4: Functional requirement of Security</p>	<p>Behaviour Monitoring Incl. Ransomware Protection (Win PC only) - Behaviour Monitoring protects endpoints from unauthorized changes to the operating system, registry entries, other software, or files and folders. Protect documents against unauthorized encryption or modification, automatically back-up and restore files changed by suspicious programs, Block processes commonly associated with ransomware, enable program inspection to detect and block compromised executable files</p>	Behaviour Monitoring Incl. Ransomware Protection (Win PC only) - Behaviour Monitoring protects endpoints from unauthorized changes to the operating system, registry entries, other software, or files and folders. Protect documents against unauthorized encryption or modification, automatically back-up and restore files changed by suspicious programs, Block processes commonly associated with ransomware, enable program inspection to detect and block compromised executable files, and should comply with Government Regulatory Compliances like GDPR, HIPAA, UIDAI, PCI-DSS-Data Privacy
47.	2	ER-250	Section VII. Technical Requirements	<p>5.1 RLVD Application</p> <p>Table 5 1: Functional Requirement of SLVD Application</p>	<p>■ Supports display of MIP SDK plug-in items on the Smart Map</p> <p>■ Application's Driver Framework enables device manufacturers to develop their drivers for SLVD applications using their SDK.</p>	Deleted
48.	2	ER 151 ER 282	Section VII. Technical Requirements	<p>4.6 Functional Requirement of Enterprise Management System (EMS) Table 4 7: Functional requirement of Enterprise Management System (EMS) 4.5 Enterprise Management System Table 4 3: Functional requirement of Enterprise Management System (EMS)</p>	<p>■ The proposed solution shall be supplied with a server with Windows or Linux-based OS (latest) or later.</p>	The proposed solution shall be supplied with a server along with other prerequisite details like Server/VM's/DB/LB/OS etc. to run the EMS components on it. Or better

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49.	2	ER 155	Section VII. Technical Requirements	4.7 Functional Requirement of Call Centre Table 4 8: Functional requirement of call centre # Interactive Voice Response (IVR)	The system should be based on server gateway architecture with external server running on Linux OS/Other. No card-based processor systems should be quoted	The system should be based on server gateway architecture with external server running on Linux /Other operating system. The system shall have without card processor and secure source code.
50.	2	ER 155	Section VII. Technical Requirements	4.7 Functional Requirement of Call Centre Table 4 8: Functional requirement of call centre # Interactive Voice Response (IVR)	The communication server and gateway should support IP V6 from day one to be future proof	The communication server and gateway should support IP V6 from start of project and shall be future proof.
51.	2	ER 296	Section VII. Technical Requirements	5.17 EPABX Table 5 17: Hardware requirement of EPABX # Technology -1	PCM-TDM, IP, Non-blocking	Revised Table 5 17: Hardware requirement of EPABX is enclosed as Annexure 2-23
52.	2	ER 296	Section VII. Technical Requirements	5.17 EPABX Table 5 17: Hardware requirement of EPABX # Max. loop resistance for analogy trunk lines - 7	Max. loop resistance for analogy trunk lines: 1200 ohms at –48 Volts DC	Revised Table 5 17: Hardware requirement of EPABX is enclosed as Annexure 2-23
53.	2	ER 296	Section VII. Technical Requirements	5.17 EPABX Table 5 17: Hardware requirement of EPABX # Expansion of Extensions -5	Expansion of Extensions: Multiples of 8/16	Revised Table 5 17: Hardware requirement of EPABX is enclosed as Annexure 2-23
54.	2	ER 296	Section VII. Technical Requirements	5.17 EPABX Table 5 17: Hardware requirement of EPABX # No. of lines -2	No. of lines - ,ISDN PRI lines & Analog / Digital Extensions: 2 PRI, 32 Extensions (IP / Analog / Digital)	Revised Table 5 17: Hardware requirement of EPABX is enclosed as Annexure 2-23

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55.	2	ER 215 ER 257 ER 272	Section VII. Technical Requirements	5.6 SFP Transceiver Table 5 5: Hardware requirement of SFP Transceiver # Data Rate-2 6.6 SFP Transceiver Table 6 5: Hardware requirement of SFP transceiver # Data Rate-2 5.5 SFP Transceiver Table 5 4: Hardware requirement of SFP transceiver # Data Rate -2	Data rate 1250 Mbps	Data rate 1/10Gbps or higher
56.	2	ER-114	Section VII. Technical Requirements	8.5 Video Wall Table 8-5: Hardware Requirement of Video Wall # Mount:-13	VESA Standard Mount Interface	Deleted, Bidder shall make the suitable arrangement for mounting the video wall in the control centre with suitable viewing angle as per control centre architecture
57.	2	ER-120	Section VII. Technical Requirements	8.13 Backup Software Table 8 13: Hardware requirement of Backup software # General-1	Backup Software Should support backup hardware like tape, virtual tape, optical disk,	Backup Software Should support backup hardware's such as tape/ virtual tape/ optical disk or equivalent.
58.	2	ER 290	Section VII. Technical Requirements	5.7 Backup Software Table 5 7: Hardware requirement of Backup software # General-1	Backup Software Should support backup hardware like tape, virtual tape, optical disk,	Backup Software Should support backup hardware's such as tape/ virtual tape/ optical disk or equivalent.
59.	2	ER 155	Employer's Requirement	Table 4-8: Functional requirement of call centre	Interactive Voice Response (IVR)	Revised Interactive Voice Response (IVR) is enclosed as Annexure 2-27

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60.	2	ER 157	Section VII. Technical Requirements	4.9 Functional Requirement of Website and Mobile Application Table 4 10: Functional requirement of website and mobile application #Website-1	■ Web Site/Mobile and infrastructure shall be able to handle a minimum of 50,00,000 hits simultaneously	■ Web Site/Mobile and infrastructure shall be able to handle a minimum of 5,00,000 hits simultaneously.
61.	2	ER 107	Section VII. Technical Requirements	7.2 Disaster Recovery Table 7 2: Functional requirement of Disaster recovery #Replication Method-2	The traffic big data analytics.	<ul style="list-style-type: none"> • The offline & Historical data shall be available for the user. • Request for real time data shall be on CCC server through internet server. • Internet server shall be used as mediator and witness (Gateway) for any external communication / data exchange. • The data generated under various scenario shall be on self-learning basis through various systems and propose the improvement methodology for commuters.
62.	2	ER 125	Section VII. Technical Requirements	8.21 UPS Parallel Redundant Table 8 21: Hardware Requirement of UPS #UPS-2	Three 3 hours or longer backup power supply for Equipment in TIMS-CCC.	The bidder may propose suitable battery type based on system design in order to perform functional requirement of the system and meet the condition under SLA.
63.	2	ER 79	Section VII. Technical Requirements	4.2 Component Systems	All Servers, Storage, Computing, LPU, Networking, Security devices etc. shall be BIS certified.	Deleted. The bidder shall submit the necessary certification for all the equipment's of the project the employer for approval before implementation.
64.	2	ER 345	Section VII. Technical Requirements	Chapter 4 Bill-Bill of Quantity (BOQ)	Chapter 4 Bill-Bill of Quantity (BOQ)	Revised Chapter 4 Bill-Bill of Quantity (BOQ) is enclosed as Annexure 2-24
65.	2	ER 282	Section VII. Technical Requirements	4.5 Enterprise Management System Table 4 3: Functional requirement of Enterprise Management System (EMS)) # Network Management and Control -1	■ The proposed solution shall allow for the display of different colours for the links including red, green, orange, yellow to show the status of the links and the connected devices	The proposed solution shall allow for the display of different colours for the links including red, green, orange OR yellow to show the status of the links and the connected device

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66.	2	ER 151	Section VII. Technical Requirements	4.6 Functional Requirement of Enterprise Management System (EMS) Table 4 7: Functional requirement of Enterprise Management System (EMS) # Network Management and Control -1	■ The proposed solution shall allow for the display of different colours for the links including red, green, orange, yellow to show the status of the links and the connected devices	The proposed solution shall allow for the display of different colours for the links including red, green, orange OR yellow to show the status of the links and the connected device
67.	2	ER 185 ER 216 ER 229 ER 243 ER 259 ER 274	Section VII. Technical Requirements	5.3 Controller Cabinet Table 5 2: Hardware requirement of Controller cabinet 5.5 Cabinet/VMS Board Table 5 4: Hardware Requirement of Cabinet/VMS Board 5.9 Cabinets Table 5 8: Hardware Requirement of Cabinets 5.11 Cabinet Table 5 10: Hardware Requirement of Cabinet 6.11 Cabinet Table 6 10: Hardware Requirement of Cabinet	An intercom jack	Deleted
68.	2	ER 151 ER 281	Section VII. Technical Requirements	Table 4-7: Functional requirement of Enterprise Management System (EMS) Table 4-3: Functional requirement of Enterprise Management System (EMS)	The proposed system shall support the exclusion of specific IP addresses or IP address ranges	The proposed system shall support the exclusion of specific IP addresses / IP address ranges and should not allow Non- Included IP addresses.

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69.	2	ER 153 ER 283	Section VII. Technical Requirements	Table 4-7: Functional requirement of Enterprise Management System (EMS) Table 4-3: Functional requirement of Enterprise Management System (EMS)	The proposed helpdesk system shall support ITIL processes like request management, problem management, configuration management, and change order management with out-of-the-box templates for various ITIL service support processes	The proposed helpdesk system shall support ITIL processes like request management, problem management, configuration management, and change management with out-of-the-box templates for various ITIL service support processes
70.	2	ER 232	Section VII. Technical Requirements	4. System Functional Requirement Page No. ER-232	4. System Functional Requirement The system should detect and record evidence of over speeding vehicles. Unmanned detection should be provided day and night. It should consist of several ANPR grade cameras installed on the road, on suitable gantry, pole, or any other suitable structure (Capture Point Units) connected to the Central control room. It should be possible for a number of such Capture Point Units to be connected to the same Central control room. Vehicle speed should be detected by physical Sensor single Doppler multi-vehicle tracking radar system. The sensors should detect any violating vehicles and give capture command to the camera for capturing images of the number plate of the violating vehicle. Single radar should be able to capture speed of vehicles on 4 lanes and can be upgradable to 6 lanes in the future or based on camera-based technology single camera per lane.	4. System Functional Requirement The system should detect and record evidence of over speeding vehicles. Unmanned detection should be provided day and night. It should consist of Single ANPR grade cameras installed on the road, pole, or any other suitable structure (Capture Point Units) connected to the Central control room. It should be possible for several such Capture Point Units to be connected to the same Central control room. Vehicle speed should be detected by physical Sensor, Single 3D or 4D multi-vehicle tracking radar system. The sensors should detect any violating vehicles and give capture command to the camera for capturing images of the number plate of the violating vehicle. Single radar should be able to capture speed of vehicles on 4 lanes and can be upgradable to 6 lanes in future. Single ANPR camera shall be able to capture violating vehicle number plate for multiple lanes.
71.	2	ER 236	Section VII. Technical Requirements	4.2 LPU (Local Processing Unit) Table 4 2: Functional Requirement of LPU Page No. ER-236 # Speed Limit Violation Detection-7	n Measurement may be made by using non-intrusive technology such as Radar integrated camera or individual radar 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	n Measurement may be made by using non-intrusive technology such as Radar integrated camera or individual radar 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 n The speed sensor/Radar OEM should have proper certifications or approvals in accordance with frequency approvals in India and Indian motor Vehicle act.

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72.	2	ER 236	Section VII. Technical Requirements	4.2 LPU (Local Processing Unit) Table 4 2: Functional Requirement of LPU Page No. ER-236 #Traffic Violation Detection-14	n 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.	n The system shall be able to detect all vehicles infracting simultaneously in each lane 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.
73.	2	ER 236	Section VII. Technical Requirements	4.2 LPU (Local Processing Unit) Table 4 2: Functional Requirement of LPU Page No. ER-236 #Traffic Violation Detection-14	e. Red Light Non-Functional or Malfunction but system shall have the functionality to track and update any such kind of alert on priority to authority and operator to register an incident	Deleted
74.	2	ER-278	Section VII. Technical Requirements	Figure 4-1: System Server Architecture the System	Internet Server for data sharing (Application & Database) x2 Control Center Management Server (Application & Database) x2	<ul style="list-style-type: none"> • Internet Server of TIMS (Application and Database) /CBS (Application and Database) to continue providing the traffic information to road users through the internet. • The Information sharing module shall be hosted on an internet server. • All the external data exchange requirements from ITS system shall be routed through the internet Server. • Internet server shall work as witness server between external agency and another internal application server for information/data exchange. • Control Center Management Server of TIMS (Application and Database) /CBS (Application and Database) to collect, process and utilize the desired information from other projects and process it for the development of sustainable mobility. <ol style="list-style-type: none"> 1. Statistical Analysis 2. Evaluation of Effectiveness
75.	2	ER-238	Section VII. Technical Requirements	5.1 Radar	Table 5 1: Hardware Requirement of SLVD Radar	Revised Table 5 1: Hardware Requirement of SLVD Radar is enclosed as Annexure 2-13
76.	2	ER-238	Section VII. Technical Requirements	5.2 Speed Display (Radar Based)	Table 5 2: Hardware requirement of Speed display (Radar based)	Revised Table 5 2: Hardware requirement of Speed display (Radar based) is enclosed as Annexure 2-14

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77.	2	ER-122 ER -292	Section VII. Technical Requirements	8.17 SAN Switch Table 8 17: Hardware requirement of SAN switch 5.11 SAN Switch Table 5 11: Hardware requirement of SAN switch	Table 8 17: Hardware requirement of SAN switch Table 5 11: Hardware requirement of SAN switch	Revised Table 8 17: Hardware requirement of SAN switch and Table 5 11: Hardware requirement of SAN switch is enclosed as Annexure 2-15
78.	2	ER-120 ER-291	Section VII. Technical Requirements	8.14 Tape Library Table 8 14: Hardware requirement of Tape library 5.8 Tape Library Table 8 14: Hardware requirement of Tape library	Table 8 14: Hardware requirement of Tape library Table 8 14: Hardware requirement of Tape library	Revised Table 8 14: Hardware requirement of Tape library and Table 8 14: Hardware requirement of Tape library is enclosed as Annexure 2-16
79.	2	ER-111	Section VII. Technical Requirements	8.2 Workstation (3 monitors) Table 8 2: Hardware Requirement of Workstation (3 monitors)	Table 8 2: Hardware Requirement of Workstation (3 monitors)	Revised Table 8 2: Hardware Requirement of Workstation (3 monitors) is enclosed as Annexure 2-18
80.	2	ER-112	Section VII. Technical Requirements	8.3 Workstation (1 monitor) Table 8 3: Hardware Requirement of Workstation (1 monitor)	Table 8 3: Hardware Requirement of Workstation (1 monitor)	Revised Table 8 3: Hardware Requirement of Workstation (1 monitor) is enclosed as Annexure 2-19
81.	2	ER-295 ER-125	Section VII. Technical Requirements	5.16 Wi-Fi Equipment Table 5 16 Hardware requirement of Wi-Fi equipment # Wi-Fi -1 5.22 Wi-Fi Equipment Table 5 22 Hardware requirement of Wi-Fi equipment # Wi-Fi -1	Contractor shall implement industrial grade and rugged Wi-Fi router device in CCC to support and operational minimum define option: <ul style="list-style-type: none"> • 802.11 – Pertains to wireless LANs and provides 1 - or 2-Mbps transmission in the 2.4-GHz band • 802.11a – an extension to 802.11 that pertains to wireless LANs and goes as fast as 54 Mbps in the 5-GHz band. • 802.11g – Pertains to wireless LANs and provides 20+ Mbps in the 2.4-GHz band. • 802.11b – 802.11 high rate WIFI is an extension to 802.11 that pertains to wireless LANs and yields a connection as fast as 11 Mbps transmission in the 2.4-GHz band 	Contractor shall implement industrial grade and rugged Wi-Fi router device in CCC to support and operational minimum define Standard: <ul style="list-style-type: none"> • 802.11n, 802.11ax • Antenna type : Dual-optimized antenna OR Higher

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82.	2	ER-194	Section VII. Technical Requirements	8 Intersection Improvement Requirement Table 8 1: Intersection improvement requirement of ATCS # Road Marking, Signages, Footpath& Median extension -3 # Signages at RLVD locations -2	• Informa Tory Sign on Gantry Boards (Size of 9600mmx2600mm)	• Informatory Sign on Gantry Boards (Size of 9600mmx 600mm)
83.	2	ER-205	Section VII. Technical Requirements	4 System Functional Requirements Table 4-1: Functional Requirement of TIDS # Image Recording and Retrieval and Recording servers -7	TIDS shall be able to allow more cameras to be run on a single recording server using 64-bit recording server	TIDS shall be able to allow more cameras to run on a single recording server.
84.		ER-79	Section VII. Technical Requirements	4.2 Component Systems	All type of cameras shall support ONVIF profile S/G and shall be FCC Class A, UL, CE, BIS certified. All Servers, Storage, Computing, LPU, Networking, Security devices etc. shall be BIS certified.	All type of cameras shall support ONVIF profile S/G and shall be UL/CE/FCC and BIS certified. All Servers, Storage, Computing, LPU, Networking, Security devices etc. shall be certified by UL/CE/FCC.
85.	2	ER-212	Section VII. Technical Requirements	5.1 Camera Type 1 - TIDS Camera (Fixed Camera)	Table 5 1: Hardware Requirement of Camera Type 1 -TIDS Camera	Revised Table 5 1: Hardware Requirement of Camera Type 1 -TIDS Camera is enclosed as Annexure 2-2
86.	2	ER-212	Section VII. Technical Requirements	5.2 Camera Type 2- PTZ Camera	Table 5 2: Hardware Requirement of Camera Type 2 -PTZ Camera	Revised Table 5 2: Hardware Requirement of Camera Type 2 -PTZ Camera is enclosed as Annexure 2-3
87.	2	ER-224	Section VII. Technical Requirements	5.1 VMS Board and Controller	Table 5 1: Hardware Requirement of VMS Board and Controller	Revised Table 5 1: Hardware Requirement of VMS Board and Controller is enclosed as Annexure 2-4
88.	2	ER-239	Section VII. Technical Requirements	5.3 ANPR Camera	Table 5 3: Hardware Requirement of ANPR Camera	Revised Table 5 3: Hardware Requirement of ANPR Camera is enclosed as Annexure 2-5
89.	2	ER-254	Section VII. Technical Requirements	6.1 RLVD Camera (Overview Camera)	Table 6 1: Hardware Requirement of RLVD Camera (Overview Camera)	Revised Table 6 1: Hardware Requirement of RLVD Camera (Overview Camera) is enclosed as Annexure 2-6

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90.	2	ER-254	Section VII. Technical Requirements	6.2 ANPR Camera	Table 6 2: Hardware Requirement of ANPR Camera	Revised Table 6 2: Hardware Requirement of ANPR Camera is enclosed as Annexure 2-7
91.	2	ER-270	Section VII. Technical Requirements	5.1 Image Recognition Detector and Processing Unit	Table 5 1: Hardware Requirement of Image Recognition Detector and Processing Unit	Revised Table 5 1: Hardware Requirement of Image Recognition Detector and Processing Unit is enclosed as Annexure 2-8
92.	2	ER-109 ER-286	Section VII. Technical Requirements	8.1 Servers 5.1 Servers	Table 8 1: Hardware requirement of Servers Table 5 1: Hardware requirement of Servers	Revised Table 8 1: Hardware requirement of Servers and Table 5 1: Hardware requirement of Servers is enclosed as Annexure 2-9
93.	2	ER-118 ER-289	Section VII. Technical Requirements	8.12 Data Storage 5.6 Data Storage	Table 8 12: Hardware Requirement of Data Storage Table 5-6: Hardware Requirement of Data Storage	Revised Table 8 12: Hardware Requirement of Data Storage and Table 5-6: Hardware Requirement of Data Storage is enclosed as Annexure 2-10
94.	2	ER-121 ER-291	Section VII. Technical Requirements	8.15 Network Switch -Level 2 5.9 Network Switch - Level 2	Table 8 15: Hardware Requirement of Network Switch -Level 2 Table 5 9: Hardware Requirement of Network Switch -Level 2	Revised Table 8 15: Hardware Requirement of Network Switch -Level 2 and Table 5 9: Hardware Requirement of Network Switch -Level 2 is enclosed as Annexure 2-11
95.	2	ER-121 ER-292	Section VII. Technical Requirements	8.16 Network Switch -Level 3 5.10 Network Switch -Level 3	Table 8 16: Hardware Requirement of Network Switch -Level 3 Table 5 10: Hardware Requirement of Network Switch -Level 3	Revised Table 8 16: Hardware Requirement of Network Switch -Level 3 and Table 5 10: Hardware Requirement of Network Switch -Level 3 is enclosed as Annexure 2-12
96.	2	ER-294 ER-123	Section VII. Technical Requirements	5.13 Firewall 8.19 Firewall	Table 8 19: Hardware Requirement of Firewall Table 5 13: Hardware Requirement of Firewall	Revised Table 8 19: Hardware Requirement of Firewall with IPS and Table 5 13: Hardware Requirement of Firewall with IPS is enclosed as Annexure 2-20
97.	2	ER-123	Section VII. Technical Requirements	8.18 Load Balancer	Table 8 18: Hardware requirement of Load balancer	Deleted, Bidder shall propose solution as per system design
98.	2	ER-278	Section VII. Technical Requirements	4. System Functional Requirement	ADDED	Revised 4. System Functional Requirement is enclosed as Annexure 2-21 This requirement is applicable for all system server architecture.
99.	2	ER-293	Section VII. Technical Requirements	5.12 Load Balancer	Table 5 12: Hardware requirement of Load balancer	Deleted, Bidder shall propose solution as per system design
100.	2	ER-125 ER-301	Section VII. Technical Requirements	Web Application Firewall (WAF) Appliance with DDOS Protection	Web Application Firewall (WAF) Appliance with DDOS Protection	Web Application Firewall (WAF) Appliance with DDOS Protection is enclosed as Annexure 2-22

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101.	2	ER-107	Section VII. Technical Requirements	7.2 Disaster Recovery Table 7-2: Functional requirement of Disaster recovery	The minimum following three (3) servers of Traffic Information and Management System which will be critical for operation at a time of disaster shall be protected by replicating them on cloud.	Traffic Information and Management System which will be critical for operation at a time of disaster shall be protected by replicating them on cloud / suitable DR.
102.	2	ER-170	Employer's Requirement	4.1 Functional Requirements of ATCS Application	ATCS should be able to calculate in real time the optimal cycle times, effective green time ratios, and change intervals for all system traffic signal controllers. Such calculations will consist of simulations carried out in the central control computer, or individual traffic signal controller, based on a data and information transmitted by the vehicle detectors at the intersections controlled by the system."	ATCS should be able to calculate in real time the optimal cycle times, effective green time ratios, and change intervals for all system traffic signal controllers. Such calculations will consist of calculations carried out in the central control computer, or individual traffic signal controller, based on a data and information transmitted by the vehicle detectors at the intersections controlled by the system."
103.	2	ER-96	Part 2, Employee Requirement, 4 Layout,	4. Layout	We request you to kindly provide the detailed drawing layout of the following along with floor plan. Also kindly provide the full address of the locations along with latitude & longitude. 1. TIMS -CCC 2. MTC - CCC	Added Layout of TIMS-CCC and CBS-CCC is enclosed as Annexure 2-25
104.	2	ER-156	Chapter 2-2 Requirements of Integrated Traffic Management System	4.7 Functional Requirement of Call Centre, IVR 4.8 Functional Requirement of IP-PABX System	Should support signalling standards/Protocols – SIP, MGCP, H.323, Q.Sig	Should support signalling standards/Protocols– SIP/ H.323/ Q. Sig
105.	2	ER-180	Employer's Requirement	Table 5-1: Hardware requirement of Controller	11. It shall not be possible to alter any basic timing parameters including minimum / maxima from a handset or portable communications device/ Changing such data shall only be possible by changing the controller's EPROM	Deleted.
106.	2	ER-180	Employer's Requirement	Table 5-1: Hardware requirement of Controller	13. Limiting Values – minimum green and intergreen timings shall each be protected by a single minimum value stored in FLASH memory, it shall be possible to arrange that this value is considered a standard value below or above which it shall not normally be permitted to specify. These standard values shall be user configurable at an appropriate password level or other appropriate means. Unless otherwise specified limiting values for minimum green shall be 8 seconds and for intergreens 5 seconds.	Limiting Values – Intergreen timings shall be protected by a single minimum value, it shall be possible to arrange that this value is considered a standard value below or above which it shall not normally be permitted to specify. These standard values shall be user configurable at an appropriate password level or other appropriate means. Unless otherwise specified limiting values for minimum intergreens shall be 5 seconds.
107.	2	ER-296	Chapter 3-1 Requirements of Command Control Centre for City Bus System	5.17 EPABX	Supported Extensions: Analog, Digital and IP	Revised Table 5 17: Hardware requirement of EPABX is enclosed as Annexure 2-23
108.	2	ER-296	Chapter 3-1 Requirements of Command Control Centre for City Bus System	5.18 Landline Phone	K.2 Land Line Phone (IP Video Phone)	K.2 Land Line Phone

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109.	2	ER-18	Section VI General Requirements	2 Scope of Work	c) Command Control Centre infrastructure including operator Video Walls, workstations, IP phones, joystick controller etc	c) Command Control Centre infrastructure including operator Video Walls, workstations, IP phones etc
110.	2	ER-208 ER-234 ER-250 ER-253	Part 2 Employers Requirements	Table 4-1: Functional Requirement of TIDS Table 4-1: Functional Requirement of SLVD Application Part 2 Employers Requirements Table 5-1: Functional Requirement of RLVD Application Table 5-2: Functional Requirement of LPU	<p>■ System shall be able to show live health status of each field component, subcomponents in control centre and system shall be able to generate alert and display in the control room for following status but not limited:</p> <p>a. Power status (Law power, UPS), b. Low battery alert, c. Cabinet door Open, Close d. Connectivity status e. Illuminator Status f. Temperature status g. Camera status h. LPU alert etc.</p>	<p>Health status and alert for the following status but not limited, of each subsystem shall be displayed in the control room.</p> <p>a. Power status (Law power, UPS), b. Low battery alert, c. Cabinet door Open, Close d. Connectivity status e. Illuminator Status f. Temperature status g. Camera status h. LPU alert etc.</p>
111.	2	ER-107	Chapter 2-1 Requirements of Control Centre and Datacentre for TIMS	7.2 Disaster Recovery Table 7-2: Functional requirement of Disaster recovery	■ Recovery Point Objective (RPO) shall be less than 24.0 hours	■ Recovery Point Objective (RPO) shall be less than 4.0 hours
112.	2	ER-118	Chapter 2-1 Requirements of Control Centre and Datacentre for TIMS	Clause 8.12 Data Storage/ Table 8.12 Hardware Requirement of Data Storage	Storage system capable of scaling vertically and horizontally	Revised 8.12 Hardware Requirement of Data Storage is enclosed as Annexure 2-10
113.	2	ER-237	Chapter 2-6 Requirements of Speed Limit Violation Detection System	4.2 LPU (Local Processing Unit) Detection Speed	■ Radar shall be capable to detect speed of vehicle form more than 120 meters.	■ Radar shall be capable to detect speed of vehicle form more than 90 meters.
114.	2	ER-42 to ER-47	Part 2 Employer's Requirement	Table 6-1: Requirement of Contractor's Personnel	Table 6-1: Requirement of Contractor's Personnel	Revised Table 6-1: Requirement of Contractor's Personnel is enclosed as Annexure 2-1

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115.	2	ER-299	Chapter 3-1 Requirements of Command Control Centre for City Bus System	5.22 Indoor Fixed Dome Camera at Command Control Centre	Table 5-23: Hardware requirement of Indoor fixed dome camera at CCC	Revised Table 5-23: Hardware requirement of Indoor fixed dome camera at CCC is enclosed as Annexure 2-26
116.	2	ER-297	Chapter 3-1 Requirements of Command Control Centre for City Bus System	5.18 Landline Phone	Digital Calling VoIP & EPABX including 2 – PRI The system shall support minimum 100 IP Phones with at least 50 concurrent sessions with features like – <ul style="list-style-type: none"> • Provide reports for calls based on records, calls on a user basis, calls through gateways etc. • Able to add bulk add, delete, and update operations for devices and users • Session Initiation Protocol (SIP) Trunk support • Centralized, configuration database, Web based management • Lightweight Directory Access Protocol (LDAP) directory interface • Facilities to users like Call Back, Call Forward, Directory Dial, Last number Redial, etc. • Calling Line Identification Table 5-19: Hardware requirement of VoIP and EPABX	Deleted
117.	2	ER-54	Section VI General Requirements	12 Pilot Implementation	12 Pilot Implementation (a) (As per RFP) (b) (As per RFP)	12 Pilot Implementation (a) (As per RFP) (b) (As per RFP) (c)The pilot implementation shall be done within first twelve months of mobilization.
118.	2	ER-287	Employer's Requirement	5.2 Video Wall	Access to the Cube: Front/Rear access	Deleted.
119.	2	ER-333	Employer's Requirement	5.1 LED display board	N/A	18. Pixel Pitch: P10 or better
120.	2	ER-310	Employer's Requirement	PREDICTION SOFTWARE REQUIREMENTS	100. The system shall use the real time location and schedule adherence data to create a continuously updated table, XML data feed and GTFS real-time data stream of the last reported location for all vehicles and the next arrival predictions within the Employer's configurable upcoming time window for all stations/stops	The system shall use the real time location and schedule adherence data to create a continuously updated table, XML or JSON data feed of GTFS real-time data stream of the last reported location for all vehicles and the next arrival predictions within the Employer's configurable upcoming time window for all stations/stops
121.	2	ER-310	Employer's Requirement	PREDICTION SOFTWARE REQUIREMENTS	101. The system shall provide this data table and XML data feed and GTFS real-time data feed to which the Employer and designated third parties have the right to perpetual and royalty-free access, for the purposes for integration with future Passenger Information System (PIS) or other public information methods and importing data into the long term database.	The system shall provide this data table and XML or JSON data feed of GTFS real-time data feed to which the Employer and designated third parties have the right to perpetual and royalty-free access, for the purposes for integration with future Passenger Information System (PIS) or other public information methods and importing data into the long term database.
122.	2	ER-310	Employer's Requirement	PREDICTION SOFTWARE REQUIREMENTS	102. The Bidder shall also provide a data dictionary and Entity Relationship Diagram for the data tables and XML schema documentation.	The Bidder shall also provide a data dictionary and Entity Relationship Diagram for the data tables and XML schema or equivalent standard for documentation.

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123.	2	ER-316	Employer's Requirement	ON-BOARD ITS (onboard computer) Interface with AVL Application	173. BDC shall provide basic map of Chennai city and Rural. Using that crew can see the vehicle location.	BDC shall provide line diagram of current running route. Using that crew can see the vehicle location.
124.	2	ER-316	Employer's Requirement	ON-BOARD ITS (onboard computer) Interface with AVL Application	188. Single Control Unit shall be capable of storing at least 8000 schedules in it.	Single Control Unit shall be capable of storing at least 400 schedules in it.
125.	2	ER-87	Employer's Requirement	17 Support Structure	The structural steel should be complied with IS 2062. The structure to support the equipment including the message board for VMS, the signal aspect for ATCS and cameras for TIDS, Camera for RLVD and Radar for SLVD, ANPR Cameras etc., shall be sturdy and aesthetically designed and capable of bearing wind loads up to 200 km/h.	The structural steel should be complied with IS 2062. The structure to support the equipment including the message board for VMS, the signal aspect for ATCS and cameras for TIDS, Camera for RLVD and Radar for SLVD, ANPR Cameras etc., shall be sturdy and aesthetically designed and capable of bearing wind loads up to 180 km/h.
126.	2	ER-79	Employer's Requirement	4.2 Component Systems	All modules except ATMS CPS application shall be third-party COTS (Commercially available off-the-shelf) enterprise edition software and only third-party COTS enterprises edition software shall be provided for the software/ solution/ application / module specified as COTS in the ToR/BOQ and no customised or proprietary software/ module of the Contractor shall be provided for applications such as NMS, VMS, GIS, etc., as approved by Engineer.	All modules/ application shall be third-party COTS (Commercially available off-the-shelf) enterprise edition software and no customized or proprietary software/ module of the Contractor shall be provided for applications such as NMS, VMS, GIS, etc., as approved by Engineer.
127.	2	ER-317	Employer's Requirement	Table 4-1: System functional requirement of CAD/AVL	<p>Contractor need to develop and customize onboard computer application to support the integration of following components without any additional cost as on when required.</p> <ul style="list-style-type: none"> • In-bus PIS board • In-bus Surveillance and analytics • Vehicle Health Monitoring and Diagnostic device using CAN bus protocol • In-bus announcement system • In-bus Route boards • Existing Variable Message Boards installed in Chennai 	<p>Contractor need to develop and customize their solution (onboard computer & backend applications) to support the integration for the ongoing projects for the following components without any additional cost.</p> <p>A. Integration (new buses)</p> <ul style="list-style-type: none"> • Panic button • Vehicle Health Monitoring and Diagnostic device using CAN bus protocol for new buses • In-bus Route boards for new buses <p>B. Integration (existing buses)</p> <ul style="list-style-type: none"> • Panic button • Vehicle Health Monitoring and Diagnostic device using CAN bus protocol for existing buses • In-bus Route boards for existing buses <p>C. Integration of other systems</p> <ul style="list-style-type: none"> • PIS and other relevant information on existing Variable Message Boards installed in Chennai <p>Integration support by MTC along with respective stakeholder shall be provided at least 6 months before the Commissioning test. In case if the required integration and support is not provided then selected bidder may proceed for Commissioning test and taking over certificate.</p>

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128.	2	ER-51	Employer's Requirement	9. Design Stage	f) Security: The architecture must adopt an end-to-end security model that protects data and the infrastructure from malicious attacks, theft, natural disasters, etc. Using Firewalls and Intrusion detection systems such as attacks and theft should be controlled and well supported (and implemented) with the security policy. The Employer may carry out the Security Audit of the entire system post acceptance / operationalization through a Third-Party Auditor (TPA) if required.	f). Security: The architecture must adopt an end-to-end security model that protects data and the infrastructure from malicious attacks, theft, natural disasters, etc. Using Firewalls and Intrusion detection systems such as attacks and theft should be controlled and well supported (and implemented) with the security policy. Security certification shall be provided by the contractor through a reputed third-party auditor who shall be appointed post approval of Employer. The security audit shall be conducted before the commissioning test and every year once during O&M period.

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129.	2	ER-385	Employer's Requirement	Table 5-21: Security Requirement Performance	No	Component	Severity Level	Requirement	Falls By percent	N o	Compon ent	Sever ity Level	Requirem ent	Falls By percent	Pena lty (INR)	Definition
					2	Vulnerability assessment and closure	Minor	Quarterly security report for all systems/ subsystems to be submitted within 1st week of each quarter. All detected vulnerabilities to be closed within 7 days of security report generation. Employer may appoint third party agency to cross-check".	100%	2	Vulnerab ility assessm ent and closure	Minor	Quarterly security report for all systems/ subsystems to be submitted within 1st week of each quarter. All detected vulnerabilities to be closed within 7 days of security report generation. Contracto r may appoint third party agency to cross-check".	100%	20,000	"Vulnerability assessment and closure" is defined as: Every year, vulnerability found in the assessment report shall be fixed and same may be verified by third party auditor appointed by Contractor after the approval from Employer.
					3	Penetration testing	Minor	Penetration testing shall be conducted once in every quarter. All vulnerabilities shall be closed within 7 days.	100%	3	Penetrati on testing	Minor	Penetratio n testing shall be conducte d once in every quarter. All vulnerabili ties shall be closed within 7 days.	100%	2,000	"Penetration testing" is defined as: vulnerability found in the testing shall be fixed and same may be verified by third party auditor appointed by Contractor.

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130.	2	ER-279	Employer's Requirement	Table 4-1: Functional requirement of Disaster recovery	The minimum following two (2) servers of City Bus System which will be critical for operation at a time of disaster shall be protected by replicating them on cloud.	All the systems mentioned in RFP to be considered for DR in case DC failure.
131.	2	ER-236	Employer's Requirement	Table 4-2: Functional Requirement of LPU	Measurement may be made by using non-intrusive technology such as Radar integrated camera or individual radar 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	Measurement may be made by using non-intrusive technology such as Radar integrated camera or individual radar having homologation certificate from Ministry of Traffic or equivalent department from respective country of origin, document authenticated by Government of India to use in urban conditions. (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
132.	2	ER_317	Employer's Requirement	Table 4-1: System functional requirement of CAD/AVL	Currently safe city project being implemented in MTC for 2500 buses. Selected bidder is expected to integrate Onboard Computer (SCU) with Mobile NVR installed in the bus to transfer the Video data to control centre where Video Management System is running.	Deleted
133.	2	ER-32	Employer's Requirement	6 Management System and Personnel	<p>6.1.2 Consortium The Prime Contractor of the consortium shall be fully responsible for any fault of the other constituent firms of the consortium. The Prime Contractor shall undertake the entire obligations under the Contract to the Employer just as though it had executed the Contract as one single Contractor for the Works.</p> <p>6.1.3 Joint Venture The Leader of the joint venture shall act on the execution of the obligations under the Contract just as the Prime Contractor under the case of consortium described above. The representative officers of such joint venture company shall concurrently be senior members of the Prime Contractor. In case any of the joint venture company become bankrupt or insolvent, or have a receiving order made against it, or compound with his creditors, or be a corporation commencing to be wound up, or be under any situation the Employer would feel uneasy to leave the execution of the Contract to their hands, then the Leader shall take over the entire obligations independently under the Contract just as though it were the single Contractor under the Contract.</p>	Deleted
134.	3	GF-6	Section XI. Contract Form	SCH 2: Schedule of Payment	SCH 2: Schedule of Payments	Revised SCH 2: Schedule of Payment is enclosed as Annexure 3-1.

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S. No	Part	Page No	Section	Clause	Published RFP Content	Revised RFP Content
135.	2	ER-18	Section VI General Requirements 2 Scope of Work	4. Provisioning of Network Infrastructure within the Roadside Equipment and Control Center	<p>f) The Right of Way (RoW) charges (If any) shall be borne by the Contractor and necessary approval shall be taken prior to commencement of the work.</p> <p>1. RoW will relate to the project roads including NH, SH and all other major and minor roads within the CMA subject to technical feasibility.</p> <p>2. The work will be carried as per the road cut specifications specified by GCC/HMPD/NHAI. Reinstatement (RI) charges/ Restoration Charges along with other fees have to be borne by the Contractor.</p> <p>3. Once the RoW work is finished satisfactorily, the ROW application Permission Fees pertaining to GCC shall be reimbursed by the Employer.(The cost of Road restoration charges is not included in this)</p>	<p>f) The Right of Way(RoW)will relate to the project roads including NH, SH, GCC and all other major and minor roads in other Local Bodies within the CMA subject to technical feasibility.</p> <p>1) The Right of Way (RoW) charges (Administrative Charges, Annual Track Rent) shall be borne by the Employer. However, the Contractor is responsible for making such application & obtaining necessary approvals which shall be taken prior to commencement of the work. Price bid should be exclusive of ROW charges (Administrative Charges, Annual Track Rent)</p> <p>2) The Restoration/ Reinstatement work will be carried as per the specifications specified by GCC/HMPD/NHAI/CMA. Reinstatement (RI) charges/ Restoration Charges along with any other fees applicable shall be borne by the Contractor.</p>

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Annexure 1-1

1.1.1 Personnel

The Bidder must demonstrate that it has the personnel for the key positions that meet the following requirements:

No.	Position	Minimum Education & Experience
1	Project Director (to be Contractor's Representative under GC 4.3) *	Education:
		-Graduate in Civil/ Electronics/Computer Science/ or equivalent
		- Post-Graduation in Management/ Civil/ Electronics/ or Equivalent
		Experience:
		-Total Work Experience: 15 years
		- Experience in Similar ITS projects: 10 years
		- Experience as Project Director/ Project Manager in Similar project of at least 10 million USD covering end to end installations: 1 Project
		-Experience in coordinating with Central/ State/ Local Government agencies in urban infrastructure
		-International experience in similar project(s)
		-Experience in similar project which includes any of the below mentioned systems in each project: 3 projects
		1.Area Traffic Signal Control System
		2.Traffic Information & Management System
		3.CAD/AVL system
		4.ITS Infrastructure or City / Campus wide System
2	Project Manager – TIMS and ATCS	Education:
		-Graduate in Civil/ Electronics/ Computer Science/ or equivalent
		- Post-Graduation in Management/ Civil/ Electronics/ or Equivalent
		Experience:
		-Total Work Experience: 12 years minimum

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No.	Position	Minimum Education & Experience
		-Experience in Similar ITS projects and involved in end-to-end implementation: 8 years - Experience as Project Manager in Similar project of at least 1 million USD covering end to end installations: 1 Project -Experience in coordinating with Central/ State/ Local Government agencies in urban infrastructure -Experience in similar project which includes any of the below mentioned systems in each project: 3 projects 1. Area Traffic Signal Control System 2. Traffic Management & Traveller Information System 3. ITS Infrastructure or City / Campus wide System 4. Command Control Centre
3	Project Manager – CBS	Education: -Graduate in Civil/ Electronics/ Computer Science/ or equivalent - Post-Graduation in Management/ Civil/ Electronics/ or Equivalent Experience: -Total Work Experience: 12 years minimum -Experience in Similar ITS projects and involved in end-to-end implementation: 8 years - Experience as Project Manager in Similar project of at least 1 million USD covering end to end installations: 1 Project -Experience in coordinating with Central/ State/ Local Government agencies in urban infrastructure -Experience in similar project which includes any of the below mentioned systems in each project: 3 projects 1. Computer Aided Dispatch/Automatic Vehicle Location system 2. Public Transit Infrastructure 3. Command Control Centre 4. Depot Management System 5. Passenger Information System
4		Education:

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No.	Position	Minimum Education & Experience
	ATCS Expert – International*	-Graduate in Civil/ Electronics/ Computer Science/ or equivalent
		Experience:
		-Total Work Experience: 12 years minimum
		-Experience in traffic signalling projects, preferably adaptive traffic signalling projects: 8 years
		-International Experience in Area Traffic Signal Control with subarea formulation of minimum 500 traffic signal in total
		-Experience in Adaptive Area Traffic Signal Control projects with subarea formulation: 3 projects
5	TIMS Expert – International*	Education:
		-Graduate in Civil/Electronics/Computer Science/or equivalent
		Experience:
		-Total Work Experience: 12 years minimum
		-Experience in designing, implementing, and integrating multiple Traffic Information & Management systems: 8 years
		-International Experience in TIMS project of integration with central platform of minimum 1000 IoT devices in total
6	CBS Expert – International*	-Experience in TIMS projects.: 3 projects.
		Education:
		-Graduate in Civil/ Electronics/ Computer Science/ or equivalent
		Experience:
		-Total Work Experience: 12 years minimum
		-Experience in CAD/AVL projects: 8 years
7	ATCS Expert – Local	-International Experience in CAD/AVL project of minimum 1000 buses (public transport) in total
		-Experience in CAD/AVL projects: 3 projects
		Education:
		-Graduate in Civil/ Electronics/ Computer Science/ or equivalent
		Experience:
		-Total Work Experience: 10 years

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No.	Position	Minimum Education & Experience
		<ul style="list-style-type: none"> - Experience in minimum 250 traffic signal in total -Experience in Traffic Signal Control of at least 0.5 million USD covering end to end installations: 1 Project -Experience in Adaptive Area Traffic Signal Control projects: 3 projects
8	TIMS Expert – Local	<p>Education:</p> <ul style="list-style-type: none"> -Graduate in Civil/Electronics/Computer Science/or equivalent <p>Experience:</p> <ul style="list-style-type: none"> -Total Work Experience: 10 years, -Experience in TIMS project of integration with central platform of minimum 500 IoT devices in total -Experience in TIMS of at least 0.5 million USD covering end to end installations: 1 Project -Experience in TIMS projects: 3 projects
9	CBS Expert – Local	<p>Education:</p> <ul style="list-style-type: none"> -Graduate in Civil/Electronics/Computer Science/or equivalent <p>Experience:</p> <ul style="list-style-type: none"> -Total Work Experience: 10 years Experience in CAD/AVL project of minimum 500 buses (public transport) in total -Experience in CBS of at least 0.5 million USD covering end to end installations: 1 Project -Experience in Public Transit System – 3 Projects 1. Computer Aided Dispatch/Automatic Vehicle Location system 2. Public Transit Infrastructure 3. Command Control Centre 4. Depot Management System 5. Passenger Information System
10	Operations Manager – CBS	<p>Education:</p> <ul style="list-style-type: none"> -Graduate degree <p>Experience:</p> <ul style="list-style-type: none"> -Total Work Experience: 10 years

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No.	Position	Minimum Education & Experience
		-Indian bus operation experience with in-depth knowledge of bus agencies and their systems. -Good understanding of ITS implementation for bus agencies with 7 years.
11	Safety Infrastructure Specialist	Education:
		- Graduate in Civil/or equivalent
		Experience:
		-Total Work Experience: 10 years
		-Experience in Similar Works as Safety Engineer: 7 years
12	Quality Control Engineer	Education:
		-Graduate in Civil/Electronics/Computer Science/or equivalent
		Experience:
		-Total Work Experience: 10 years
		-Experience in designing and implementing Quality Assurance and Quality Control processes: 7 years
		-Experience in relevant projects: 2 projects
13	Finance Manager	Education:
		- Graduate in Commerce /CA/ CFA/ MBA Finance
		Experience:
		-Total Work Experience: 10 years
		-Experience in Similar Works as Accounts/Finance: 7 years
		-Experience in relevant projects: 2 projects
14	Traffic/Transportation Engineer/ Planner	Education:
		- Graduate in Civil/ Architecture / Equivalent
		-Masters in Transportation/or Planning/ Urban design/ Infrastructure or equivalent
		Experience:
		-Total Work Experience: 10 years
		-Experience in Similar Works as Traffic/ Transportation Engineer: 7 years
		-Experience in relevant projects: 2 projects
Note: The positions with asterisk (*) which shall be the international experience.		

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Annexure 1-2

(1) Evaluation of Specific Technical Experience

Each item of the specific experience with Bid in Form EXP – 1 and EXP 2(a) will be reviewed and evaluated for specific technical experience for qualifying project as per 2.4.2 of section III.

No	Specific Technical Experience	Marks
1	Qualifying projects as per 2.4.1 – General Experience:	5
	a. Any 2 qualifying Customers/Clients/Projects	3
	b. Any 3 qualifying Customers/Clients/Projects	4
	c. Any 4 or more qualifying Customers/Clients/Projects	5
2	Qualifying projects as per 2.4.2 (a1) – Adaptive Traffic Signal Control System:	5
	a. Any 2 qualifying Customers/Clients/Projects	3
	b. Any 3 qualifying Customers/Clients/Projects	4
	c. Any 4 or more qualifying Customers/Clients/Projects	5
3	Qualifying projects as per 2.4.2 (a2) - Traffic Information & Management System:	5
	a. Any 2 qualifying Customers/Clients/Projects	3
	b. Any 3 qualifying Customers/Clients/Projects	4
	c. Any 4 or more qualifying Customers/Clients/Projects	5
4	Qualifying projects as per 2.4.2 (a3) - City Bus System:	5
	a. Any 2 qualifying Customers/Clients/Projects	3
	b. Any 3 qualifying Customers/Clients/Projects	4
	c. Any 4 or more qualifying Customers/Clients/Projects	5
	Total	20

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Annexure 1-3

(3) Evaluation of Key Staff

Each item of proposed personnel and their experience records in Similar Works in Forms PER-1 and PER-2 will be reviewed and evaluated.

No.	Position	Maximum Marks
1	Project Director	2
	≥ 15 years to ≤ 16 years	1
	≥ 17 years	2
2	Project Manager TIMS and ATCS	2
	≥ 12 years to ≤ 13 years	1
	≥ 14 years	2
3	Project Manager CBS	2
	≥ 12 years to ≤ 13 years	1
	≥ 14 years	2
4	ATCS Expert – International	2
	≥ 12 years to ≤ 13 years	1
	≥ 14 years	2
5	TIMS Expert – International	2
	≥ 12 years to ≤ 13 years	1
	≥ 14 years	2
6	CBS Expert – International	2
	≥ 12 years to ≤ 13 years	1
	≥ 14 years	2
7	ATCS Expert – Local	1
	≥ 10 years to ≤ 11 years	0.5
	≥ 12 years	1
8	TIMS Expert – Local	1
	≥ 10 years to ≤ 11 years	0.5
	≥ 12 years	1
9	CBS Expert – Local	1
	≥ 10 years to ≤ 11 years	0.5

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No.	Position	Maximum Marks
	≥ 12 years	1
10	Operation Manager CBS	1
	≥ 10 years to ≤ 11 years	0.5
	≥ 12 years	1
11	Safety Infrastructure Specialist	1
	≥ 10 years to ≤ 11 years	0.5
	≥ 12 years	1
12	Quality Control Engineer	1
	≥ 10 years to ≤ 11 years	0.5
	≥ 12 years	1
13	Finance Manager	1
	≥ 10 years to ≤ 11 years	0.5
	≥ 12 years	1
14	Traffic/Transportation Engineer/Planner	1
	≥ 10 years to ≤ 11 years	0.5
	≥ 12 years	1
Total		20

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Annexure 1-4

2.4 Experience

Eligibility and Qualification Criteria			Compliance Requirements				Documentation
No.	Factor/ Sub-Factor	Requirement	Single Entity	Joint Venture (existing or intended)			Submission Requirements
				All Parties Combined	Each Member	One Member	
2.4 Experience							
2.4.1	General Experience	The Bidder (Single Entity or JV Member) shall have successfully executed/ completed at least two (2) projects in Transportation/ Transit/ Traffic/ ICT Systems with a minimum value of USD 10 Million per project for at least the last 10 years starting 1st January 2012.	Must meet requirement	Must meet requirement	N/A	N/A	Form EXP - 1
2.4.2 (a1)	Specific Experience for ATCS with Subarea Formulation	The Bidder (single entity or JV member) shall have successfully commissioned/ Go-Live of ATCS Systems with Subarea Formulation with at least two (2) customer/ client/ project: (1) in the last 10 years starting 1st Jan 2012 or (2) Implemented in the last 15 years starting 1st Jan 2007 and in continuous operations till date with the bidder. Each customer/ client/ project shall meet the criteria mentioned below: A. Bidder should have supplied and commissioned Central ATCS Platform for each customer/ client/ project of: (i) at least 300 Adaptive Traffic Signals integrated with Central ATCS Platform and (ii) shall be of minimum value of USD one (1) million for each customer/ client/ project. OR B. The bidder should have supplied, installed, and commissioned for each customer/ client/ project of: (i) at least 75 Adaptive Traffic Signals integrated with Central ATCS Platform and (ii) shall be of minimum value of USD Half (0.5) Million.	Must meet requirement	Must meet requirement	N/A	N/A	Form EXP - 2(a)

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Eligibility and Qualification Criteria			Compliance Requirements			Documentation	
No.	Factor/ Sub-Factor	Requirement	Single Entity	Joint Venture (existing or intended)			Submission Requirements
				All Parties Combined	Each Member	One Member	
2.4.2 (a2)	Specific Experience for Traffic Information & Management System	<p>The Bidder (single entity or JV member) shall have successfully commissioned/Go-Live Central Integrated Traffic Information & Management System (TIMS) Platform with at least two customers/ clients/ project: (1) in the last 10 years starting 1st Jan 2012 or (2) Implemented in the last 15 years starting 1st Jan 2007 and in continuous operations till date with the bidder. The TIMS platform for each customer/ client/ project should have been integrated with at least three (3) of the following subareas for a city-wide / campus-wide deployment having minimum value of USD five (5) million:</p> <ul style="list-style-type: none">• City/Campus Surveillance with at least 100 cameras/ equipment• Information Dissemination with at least 15 Variable Message Signs• Red Light Enforcement System with at least 50 Stop line violation detection cameras/ equipment coupled with license plate recognition• Speed Enforcement System with at least 10 speed detection devices coupled with license plate recognition• Automatic Traffic Counters & Classification devices with at least 50 equipment• Traffic Incident Detection System with at least 50 camera /equipment• Automatic Number Plate Recognition with at least 50 camera /equipment• Traffic Signal with 50 locations/junctions	Must meet requirement	Must meet requirement	N/A	N/A	Form EXP - 2(a)
2.4.2 (a3)	Specific Experience for City Bus System	<p>The Bidder (single entity or JV member) shall have successfully commissioned/Go-Live with at least two customer/ client/ project: (1) in the last 10 years starting 1st Jan 2012 or (2) Implemented in the last 15 years starting 1st Jan 2007 and in continuous operations till date with the bidder. Each customer/ client/ project shall have a minimum value of USD Half (0.5) Million and meet the criteria mentioned below:</p> <p>Bidder shall have successfully commissioned/Go-Live Intra-city CAD/AVL Systems integrated with real time Passenger Information System (PIS). Each CAD/AVL implementation should be controlling a fleet of at least 200 public transit vehicles.</p>	Must meet requirement	Must meet requirement	N/A	N/A	Form EXP - 2(a)
Notes for the Bidder (i). Subcontractor experience or qualifications shall not be allowed for any criterion as defined under 2.4							

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Annexure 1-5

2.5 Subcontractors/manufacturers

Subcontractors/manufacturers for the following major items of supply or services must meet the following minimum criteria, herein listed for that item:

Item No.	Description of Item	Minimum Criteria to be met
1	ATCS Platform	Manufacturer should have supplied for two ATCS projects, which have been commissioned in last 10 years.
2	ATCS Controllers	Manufacturer shall have at supplied/deployed the same for at least 1000 intersections in last 10 years.
3	TIMS Platform	Manufacturer should have supplied for two TIMS projects, which have been commissioned in last 10 years.
4	Variable Message Signs	Manufacturer shall have supplied/deployed at least 100 similar units in last 10 years.
5	Red Light Violation System	Manufacturer shall have supplied/deployed at least 200 similar units in last 10 years.
6	Speed Limit Violation Detection System	Manufacturer shall have supplied/deployed at least 50 similar units in last 10 years.
7	Automatic Traffic Counter & Classifier	Manufacturer shall have supplied/deployed at least 100 similar units in last 10 years.
8	CAD/AVL Application	Manufacturer should have supplied for two CAD/AVL projects, which have been commissioned in last 10 years.
9	Depot Management System	Manufacturer should have supplied for two DMS projects, which have been commissioned in last 10 years.
10	AVL Devices	Manufacturer shall have supplied/deployed at least 1500 similar units in last 10 years.
11	Passenger Information System	Manufacturer shall have supplied/deployed at least 100 similar outdoor units in last 10 years.
12	Video Wall & Controller	Manufacturer shall have at supplied/deployed at least 100 similar units last 10 years.
13	Enterprise Management System	Manufacturer should have supplied for two Enterprise Management System projects, which have been commissioned in last 10 years.
14	Operation and Maintenance of TIMS	Sub-Contractor shall have experience at least 2 similar projects (please refer to 2.4.2 (a2)) in last 10 years.
15	Operation and Maintenance of CBS	Sub-Contractor shall have experience at least 2 similar projects (please refer to 2.4.2 (a3)) in last 10 years.

Failure to comply with this requirement will result in rejection of the subcontractor/manufacturer. In the case of a bidder who offers to supply and install major items of supply under the contract that the bidder did not manufacture or otherwise produce, the bidder shall provide the manufacturer's authorization, using form MAN provided in Section IV, Bidding Forms, showing that the bidder has been duly authorized by the manufacturer or producer of the related plant and equipment or component to supply and install that item in the employer's country. The bidder is responsible for ensuring that the manufacturer or producer complies with the requirements of ITB 4 and ITB 5 and meets the minimum criteria listed above for that item.

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The similarity of similar project or same shall be based on the physical size, complexity, methods/ technology and/ or other characteristics described in Section VI, Employer's Requirements. summation of number of small value contracts (less than the value specified under requirement) to meet the overall requirement will not be accepted.

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Annexure 1-6

Break Down of Price Schedule No.2

Item No.	Description	Unit	Qty	Foreign Currency (*)		Indian Rupees (Rs)	
				Unit Rate	Amount	Unit Rate	Amount
(1)	(2)	(3)	(4)	(5)	(4)x(5)	(6)	(4)x(6)
201	Chennai Traffic Information & Management System Command Control Centre (TIMS-CCC)						
i	Control Centre Room	-	-				
A1	Call Centre Application and Database	No	1				
A2	IP PABX System with IVR	No	1				
A3	Operator Client Licenses	Lot	1				
ii	Meeting Room	-	-				
A4	70" LED display	Nos	2				
A5	Over Head Projector	No	1				
iii	Furniture	-	-				
A6	TIMS Operation Room Operator Desks	Lot	1				
A7	TIMS Management Room Manager's Desks	Lot	1				
A8	TIMS Management Room Meeting Table (14-Seater or More)	Lot	1				
A9	Call Centre Operator Desks	Lot	1				
A10	Security Room Desks	Lot	1				
A11	Help Desk Team Desks	Lot	1				
A12	Technical Support Team Desks	Lot	1				
A13	Meeting Room Furniture (10-Seater or More)	Lot	1				
A14	High Back Executive Chair	Lot	1				
iv	Building Utilities	-	-				

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Item No.	Description	Unit	Qty	Foreign Currency (*)		Indian Rupees (Rs)	
				Unit Rate	Amount	Unit Rate	Amount
(1)	(2)	(3)	(4)	(5)	(4)x(5)	(6)	(4)x(6)
A15	Interior works including fall ceiling, utility duct, Accessories as per requirement (Power Switch Boards, PVC Conduits, Power and Network cables, etc) (Approx. 7500 Sq. Ft)	Lot	1				
A16	Access Control System	Nos	4				
A17	Fire & Smoke Detection System	Lot	1				
A18	Lighting	Lot	1				
A19	DG Set for TIMS Control Centre with 72 hours backup	No	1				
A20	Air-condition for TIMS Control Centre	Lot	1				
A21	UPS Parallel Redundant with Battery backup of 3 hours	Lot	1				
A22	CCTV surveillance at TIMS Control Centre	Nos	4				
A23	PA system for building	Lot	1				
A24	Wi-Fi accessible across control centre	Lot	1				
A25	Provision for Sanitization	Lot	1				
v	Hardware Components	-	-				
	Hardware Components for Data Centre	-	-				
A26	Network Racks	Lot	1				
A27	Server Racks	Lot	1				
A28	Servers- (As per System Design)	Lot	1				
A29	Internet Server	Lot	1				
A30	Load Balancer	Lot	1				
A31	Firewall with IPS	Lot	1				
A32	Data Storage	Lot	1				
A33	SAN Switch	Lot	1				
A34	Network Switch -Level 3	Lot	1				
A35	Network Switch -Level 2 (24 Port)	Lot	1				

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Item No.	Description	Unit	Qty	Foreign Currency (*)		Indian Rupees (Rs)	
				Unit Rate	Amount	Unit Rate	Amount
(1)	(2)	(3)	(4)	(5)	(4)x(5)	(6)	(4)x(6)
A36	Network Switch -Level 2 (48 Port)	Lot	1				
A37	Web Application Firewall (WAF) Appliance with DDOS Protection	Lot	1				
A38	Tape Drive	Nos	1				
A39	Cartridge Magazine	Lot	1				
	Hardware components for Control Centre	-	-				
A40	Video Wall Panel, with Controller, 70"	Nos	48				
A41	Video Wall Switcher	No	1				
A42	Multi-Function Laser Printer – Colour A3, A4 (TIMC Management Room)	Nos	2				
A43	Operator Workstations -3 Monitor (Main Control Room)	Nos	15				
A44	Manager Workstation	No	3				
A45	Help Desk Team Workstations (Main Control Room)	Nos	2				
A46	Technical Support Team Workstations	Nos	6				
A47	Call Centre Workstations	Nos	4				
A48	Security Room Workstations	Nos	1				
A49	Meeting/Situation Room Workstation	No	1				
A50	IP Phones	Nos	37				
A51	Call Recording Device	No	1				
	Software Components at Data Centre	-	-				
A52	Video wall management Software	Lot	1				
A53	Virtualization Software	Lot	1				
A54	Centralized Antivirus Software	Lot	1				
A55	Access Control System Software	Lot	1				
A56	Backup software	Lot	1				
A57	CAL, OS, database license, Other Software for Data center	Lot	1				

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Item No.	Description	Unit	Qty	Foreign Currency (*)		Indian Rupees (Rs)	
				Unit Rate	Amount	Unit Rate	Amount
(1)	(2)	(3)	(4)	(5)	(4)x(5)	(6)	(4)x(6)
vi	Network Bandwidth	-	-				
	TIMS Network Backbone	-	-				
A58	Redundant Bandwidth Cost (For Edge Equipment)	Lot	1				
A59	Primary Internet Bandwidth (For TIMS to CBS Data Centre)	Lot	1				
A60	Primary Internet Bandwidth (For TIMS to DR)	Lot	1				
A61	Secondary Internet Bandwidth (For TIMS to CBS Data Centre)	Lot	1				
A62	Secondary Internet Bandwidth (For TIMS to DR)	Lot	1				
vii	ITMS						
A63	ITMS (Application Software)	Lot	1				
A64	EMS Application	No	1				
A65	Website	No	1				
A66	Mobile Application (Android & iOS)	No	1				
viii	Mandatory Spare Parts						
A67	L3 Switch (Copper /OFC)	Nos	1				
A68	LEVEL 2 Switch (24 Port)	Nos	1				
A69	LEVEL 2 Switch (48 Port)	Nos	1				
A70	SAN-SW	Nos	1				
A71	IP Phones	Nos	2				
A72	Call Recording Device	Nos	1				
ix	Other Items	-	-				
A73	Other items required to meet the RFP requirements of TIMS-CCC	Lot	1				
	Subtotal of Chennai Traffic Information & Management System Command Control Centre (TIMS-CCC)						
202	Adaptive Traffic Signal Control System (ATCS)						

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Item No.	Description	Unit	Qty	Foreign Currency (*)		Indian Rupees (Rs)	
				Unit Rate	Amount	Unit Rate	Amount
(1)	(2)	(3)	(4)	(5)	(4)x(5)	(6)	(4)x(6)
i	Controller with accessories	-	-				
B1	Signal Controller	Nos	165				
B2	Controller Cabinet	Nos	165				
ii	Detector	-	-				
B3	Vehicle Detector	Nos	570				
iii	Mounting	-	-				
B4	Standard Poles	Nos	716				
B5	Cantilever Poles	Nos	567				
iv	Aspects & Activation Buttons	-	-				
B6	Vehicular Aspect - Red Ball	Nos	1158				
B7	Vehicular Aspect - Amber Ball	Nos	1158				
B8	Vehicular Aspect - Green Ball / Straight	Nos	953				
B9	Vehicular Aspect - Green Arrow Left	Nos	814				
B10	Vehicular Aspect - Green Arrow Right	Nos	839				
B11	Vehicular Aspect - Red Arrow Right	Nos	260				
B12	Vehicular Aspect - Amber Arrow Right	Nos	260				
B13	Pedestrian Aspects – Walk	Nos	1154				
B14	Pedestrian Aspects - Flashing Don't Walk with Timer	Nos	1154				
B15	Pedestrian - Push Button	Nos	1154				
B16	Pedestrian Buzzer	Nos	1154				
B17	Green U- turn aspect	Nos	57				
V	Software	-	-				
B18	ATCS Application	Lot	1				
vi	Connectivity	-	-				

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Item No.	Description	Unit	Qty	Foreign Currency (*)		Indian Rupees (Rs)	
				Unit Rate	Amount	Unit Rate	Amount
(1)	(2)	(3)	(4)	(5)	(4)x(5)	(6)	(4)x(6)
B19	Network Equipment with accessories	Nos	165				
vii	Power Requirements	-	-				
B20	Outdoor UPS with batteries for 3-hour backup for field elements	Nos	165				
viii	Mandatory Spare Parts	-	-				
B21	Standard Poles	Nos	46				
B22	Cantilever Poles	Nos	34				
B23	Signal Controller	Nos	10				
B24	Controller Cabinet	Nos	10				
B25	Vehicle Detector	Nos	34				
B26	Vehicular Aspect - Red Ball	Nos	70				
B27	Vehicular Aspect - Amber Ball	Nos	70				
B28	Vehicular Aspect - Green Ball / Straight	Nos	58				
B29	Vehicular Aspect - Green Arrow Left	Nos	50				
B30	Vehicular Aspect - Green Arrow Right	Nos	50				
B31	Vehicular Aspect - Red Arrow Right	Nos	16				
B32	Vehicular Aspect - Amber Arrow Right	Nos	16				
B33	Pedestrian Aspects – Walk	Nos	70				
B34	Pedestrian Aspects - Flashing Don't Walk with Timer	Nos	70				
B35	Pedestrian - Push Button	Nos	70				
B36	Pedestrian Buzzer	Nos	70				
B37	Green U - turn aspect	Nos	5				
B38	Network Equipment with accessories	Nos	3				
B39	Outdoor UPS with batteries for 3-hour backup for field elements	Nos	8				
ix	Other items	-	-				

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Item No.	Description	Unit	Qty	Foreign Currency (*)		Indian Rupees (Rs)	
				Unit Rate	Amount	Unit Rate	Amount
(1)	(2)	(3)	(4)	(5)	(4)x(5)	(6)	(4)x(6)
B40	Other items required to meet the RFP requirements of ATCS	Lot	1				
	Subtotal of Adaptive Traffic Control System (ATCS)						
203	Traffic Incident Detection System (TIDS)						
i	Equipment	-	-				
C1	TIDS (Application Software)	Lot	1				
C2	TID Camera	Nos	60				
C3	PTZ Camera	Nos	58				
C4	Controller	Nos	58				
C5	Network Equipment with accessories	Nos	58				
C6	UPS for 3-hour backup with Batteries and Outdoor junction Box	Nos	58				
ii	Material	-	-				
C7	Cabinet	Nos	58				
C8	Pole Type-A	Nos	39				
C9	Pole Type-B	Nos	8				
C10	Pole Type-C	Nos	11				
lii	Mandatory Spare Parts	-	-				
C11	Cabinet	Nos	3				
C12	Pole Type-A	Nos	2				
C13	Pole Type-B	Nos	1				
C14	Pole Type-C	Nos	1				
C15	TID Camera	Nos	4				
C16	PTZ Camera	Nos	3				
C17	TIDS Cameras Controller	Nos	3				

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Item No.	Description	Unit	Qty	Foreign Currency (*)		Indian Rupees (Rs)	
				Unit Rate	Amount	Unit Rate	Amount
(1)	(2)	(3)	(4)	(5)	(4)x(5)	(6)	(4)x(6)
C18	Network Equipment with accessories	Nos	3				
C19	UPS for 3-hour backup with Batteries and Outdoor junction Box	Nos	3				
Iv	Other items	-	-				
C20	Other items required to meet the RFP requirements of TIDS	Lot	1				
	Subtotal of Traffic Incident Detection System (TIDS)						
204	Variable Message Sign System (VMS)						
i	Equipment	-	-				
D1	VMS System (Application Software)	Lot	1				
D2	VMS Board with controller and necessary accessories	Nos	17				
D3	Network Equipment with accessories	Nos	17				
D4	UPS for 3- hours backup with Batteries and Outdoor junction Box	Nos	17				
ii	Material	-	-				
D5	Cabinet	Nos	17				
D6	Gantry	Nos	17				
iii	Mandatory Spare Parts	-	-				
D7	VMS Board with controller and necessary accessories	No	1				
D8	Network Equipment with accessories	No	1				
D9	UPS for 3- hours backup with Batteries and Outdoor junction Box	No	1				
iv	Other items	-	-				
D10	Other items required to meet the RFP requirements of VMS	Lot	1				
	Subtotal of Variable Message Sign System (VMS)						
205	Speed Limit Violation Detection System (SLVD)						

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Item No.	Description	Unit	Qty	Foreign Currency (*)		Indian Rupees (Rs)	
				Unit Rate	Amount	Unit Rate	Amount
(1)	(2)	(3)	(4)	(5)	(4)x(5)	(6)	(4)x(6)
i	Equipment	-	-				
E1	SLVD (Application Software)	Lot	1				
E2	Doppler Radar and ANPR Camera	Nos	11				
E3	IR Illuminator/Flash for SLVD	Nos	11				
E4	Local Software for SLVD	Nos	11				
E5	LPU for SLVD	Nos	11				
E6	Speed Display Board (Radar based)	Nos	11				
E7	Network Equipment with accessories	Nos	11				
E8	UPS for 3-hours backup with Batteries and Outdoor junction Box	Nos	11				
ii	Material	-	-				
E9	Cabinet	Nos	11				
E10	Standard Pole	Nos	11				
iii	Mandatory Spare parts	-	-				
E11	Cabinet	Nos	1				
E12	Standard Pole	Nos	1				
E13	Doppler Radar and ANPR	Nos	2				
E14	IR Illuminator for SLVD	Nos.	2				
E15	LPU for SLVD	No	1				
E16	Speed display (Radar based)	No	1				
E17	Network Equipment with accessories	No	1				
E18	UPS for 3 -hours backup with Batteries and Outdoor junction Box	No	1				
iv	Other items	-	-				
E19	Other items required to meet the RFP requirements of SLVD	Lot	1				
	Subtotal of Speed Limit Violation Detection System (SLVD)						

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Item No.	Description	Unit	Qty	Foreign Currency (*)		Indian Rupees (Rs)	
				Unit Rate	Amount	Unit Rate	Amount
(1)	(2)	(3)	(4)	(5)	(4)x(5)	(6)	(4)x(6)
206	Red Light Violation Detection System (RLVD)						
i	Equipment	-	-				
F1	RLVD System (Application Software)	Lot	1				
F2	ANPR Camera (One per lane)	Nos	439				
F3	IR Illuminator for ANPR	Nos	439				
F4	RLVD Camera	Nos	165				
F5	Local Software for ANPR	Nos	439				
F6	Local Software for RLVD	Nos	165				
F7	LPU for RLVD & ANPR	Nos	165				
F8	Network Equipment with accessories	Nos	50				
F9	UPS for 3h backup with Batteries and Outdoor junction Box	Nos	50				
ii	Material	-	-				
F10	Cabinet	Nos	50				
F11	Gantry (U-Type)	Nos	135				
F12	Cantilever Pole (L-Type)	Nos	30				
iii	Mandatory Spare Parts	-	-				
F13	Cabinet	Nos	3				
F14	Gantry (U-Type)	Nos	1				
F15	Cantilever Pole (L-Type)	Nos	2				
F16	ANPR Camera (One per lane)	Nos	23				
F17	IR Illuminator for ANPR	Nos	23				
F18	RLVD Camera	Nos	12				
F19	LPU for RLVD & ANPR	Nos	12				

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Item No.	Description	Unit	Qty	Foreign Currency (*)		Indian Rupees (Rs)	
				Unit Rate	Amount	Unit Rate	Amount
(1)	(2)	(3)	(4)	(5)	(4)x(5)	(6)	(4)x(6)
F20	Network Equipment with accessories	Nos	3				
F21	UPS for 3- hours backup with Batteries and Outdoor junction Box	Nos	3				
iv	Other items	-	-				
F22	Other items required to meet the RFP requirements of RLVD	Lot	1				
	Subtotal of Red-Light Violation Detection System (RLVD)						
207	Automatic Traffic Cum- Counter (ATCC)						
i	Equipment	-	-				
G1	ATCC1 System (Application Software)	Lot	1				
G2	ATCC2 System (Application Software)	Lot	1				
G3	Image Recognition Detector	Nos	230				
G4	Processing Unit	Nos	230				
G5	Network Equipment with accessories	Nos	230				
G6	UPS for 3- hours backup with Batteries and Outdoor junction Box	Nos	230				
ii	Material	-	-				
G7	Cantilever Pole with Dual Arm	Nos	54				
G8	Cantilever Pole with Single Arm	Nos	117				
G9	Cabinet	Nos	171				
iii	Mandatory Spare Parts	-	-				
G10	Cantilever Pole with Dual Arm	Nos	3				
G11	Cantilever Pole with Single Arm	Nos	6				
G12	Cabinet	Nos	6				
G13	Image Recognition Detector	Nos	12				
G14	Processing Unit	Nos	12				

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Item No.	Description	Unit	Qty	Foreign Currency (*)		Indian Rupees (Rs)	
				Unit Rate	Amount	Unit Rate	Amount
(1)	(2)	(3)	(4)	(5)	(4)x(5)	(6)	(4)x(6)
G15	Network Equipment	Nos	12				
G16	UPS for 3h backup with Batteries and Outdoor junction Box	Nos	12				
iv	Other items	-	-				
G17	Other items required to meet the RFP requirements of ATCC	Lot	1				
	Subtotal of Automatic Traffic Cum- Counter (ATCC)						
208	Computer Aided Dispatch/ Automatic Vehicle Location System (CAD/AVL)						
i	CAD/AVL Software						
H1	CAD/AVL Central Application	Lot	1				
H2	EMS Application	Lot	1				
ii	CAD/AVL Hardware	-	-				
H3	Onboard ITS Device (SCU & BDC)	Nos	2940				
H4	SIM Cards	Nos	3500				
H5	Cable and necessary components to connect panic button, VHMD device, In-bus route boards with SCU	Nos	3500				
H6	Workstation at Depot - with 21" dual monitor	Nos	31				
H7	UPS for 3 hours backup with Batteries	Nos	31				
iii	CAD/AVL Mandatory Spare Parts	-	-				
H8	Onboard ITS Device (SCU&BDC)	Nos	147				
H9	Workstation at Depot - with 21" dual monitor	Nos	2				
H10	UPS for 3 hours backup with Batteries	Nos	2				
iv	Integration items	-	-				
H11	Integration of panic button in 3500 buses (560 new & 2940 existing buses)	Nos	3500				
H12	Integration of Vehicle Health and Monitoring Device in 560 new buses	Nos	560				
H13	Integration of in-bus route boards in 560 new buses	Nos	560				

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Item No.	Description	Unit	Qty	Foreign Currency (*)		Indian Rupees (Rs)	
				Unit Rate	Amount	Unit Rate	Amount
(1)	(2)	(3)	(4)	(5)	(4)x(5)	(6)	(4)x(6)
H14	Integration of Vehicle Health and Monitoring Device in 2940 existing buses	Nos	2940				
H15	Integration of in-bus route boards in 2940 existing buses	Nos	2940				
H16	Integration with existing 110 variable message boards	Nos	1				
v	Other items	-	-				
H17	Other items required to meet the RFP requirements of CAD/AVL	Lot	1				
	Subtotal of Computer Aided Dispatch/ Automatic Vehicle Location System (CAD/AVL)						
209	Passenger Information System (PIS)						
i	PIS Software	-	-				
I1	PIS Software with ETA/ETD calculation	No	1				
I2	Commuter Website	No	1				
I3	Commuter SMS System	No	1				
I4	Commuter Mobile Application (Android & iOS)	No	1				
ii	PIS Hardware	-	-				
I5	Type A - PIS - LED boards at Terminals	Nos	20				
I6	Type B - PIS - LED 4 Line boards	Nos	96				
I7	Type C - PIS - LED 2 Line boards	Nos	500				
I8	Pole	Nos	20				
I9	SIM Cards	Nos	616				
I10	UPS for 3 hours backup with Batteries and Outdoor junction Box	Nos	20				
I11	UPS for 1 hour backup for 4-line and 2-line boards with Batteries and Outdoor junction Box	No	596				
iii	PIS Mandatory Spare Parts	-	-				
I12	Type A - PIS - LED boards at Terminals	No	1				
I13	UPS for 3 hours backup with Batteries and Outdoor junction Box	Nos	1				

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Item No.	Description	Unit	Qty	Foreign Currency (*)		Indian Rupees (Rs)	
				Unit Rate	Amount	Unit Rate	Amount
(1)	(2)	(3)	(4)	(5)	(4)x(5)	(6)	(4)x(6)
I14	Type B - PIS - LED 4 Line boards	Nos	5				
I15	Type C - PIS - LED 2 Line boards	Nos	20				
I16	UPS for 1 hour backup for 4-line and 2-line boards with Batteries and Outdoor junction Box	Nos	25				
iv	Other items	-	-				
I17	Other items required to meet the RFP requirements of PIS	Lot	1				
	Subtotal of Passenger Information System (PIS)						
210	Depot Management System (DMS)						
i	DMS Software	-	-				
J1	Vehicle Planning and Scheduling	No	1				
J2	Vehicle Dispatch and Crew Rostering	No	1				
J3	Attendance Management System	No	1				
J4	MTC Staff Mobile Application (Android & iOS)	No	1				
ii	DMS Hardware	-	-				
J5	Workstation at Depot - with 21" single monitor	Nos	31				
J6	Printer Laser – A4	Nos	31				
J7	Biometric Reader	Nos	62				
J8	UPS with 3 hours backup for DMS Workstation & Printer	Nos	31				
iii	Mandatory Spare Parts	-	-				
J9	Biometric Reader	Nos	4				
J10	Workstation at Depot - with 21" single monitor	Nos	2				
J11	UPS with 3 hours backup for DMS Workstation & Printer	Nos	2				
v	Other items	-	-				
J12	Other items required to meet the RFP requirements of DMS	Lot	1				

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Item No.	Description	Unit	Qty	Foreign Currency (*)		Indian Rupees (Rs)	
				Unit Rate	Amount	Unit Rate	Amount
(1)	(2)	(3)	(4)	(5)	(4)x(5)	(6)	(4)x(6)
	Subtotal of Depot Management System (DMS)						
211	CBS Command Control Centre (CBS-CCC)						
i	Control Centre Room	-	-				
K1	IP PABX/EPABX System including 2 - PRI lines	No	1				
K2	Land Line Phone (IP phone Video Phones)	Nos	14				
ii	Meeting Room	-	-				
K3	70" LED display	No	1				
iii	Furniture	-	-				
K4	Control centre Table and Chair as per the proposed layout	Lot	1				
iv	Building Utilities	-	-				
K5	Fire & Smoke Detection System	Lot	1				
K6	Lighting	Lot	1				
K7	DG Set CBS (ITS equipment Load Only) 72 hours backup	No	1				
K8	100% parallel redundant UPS with 3 hours backup	Lot	1				
K9	CCTV surveillance at CBS Control Centre	Nos	4				
K10	Wi-Fi accessible at control Center	Lot	1				
K11	Provision for Sanitization	Lot	1				
K12	Interior works including fall ceiling, utility duct, Accessories as per requirement (Power Switch Boards, PVC Conduits, Power and Network cables, etc) (Approx. 2500 Sq. Ft)	Lot	1				
v	Hardware Components	-	-				
K13	Network Racks	Lot	1				
K14	Server Racks	Lot	1				
K15	Servers (AVL, PIS & DMS)	Lot	1				

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Item No.	Description	Unit	Qty	Foreign Currency (*)		Indian Rupees (Rs)	
				Unit Rate	Amount	Unit Rate	Amount
(1)	(2)	(3)	(4)	(5)	(4)x(5)	(6)	(4)x(6)
K16	Internet Server	Lot	1				
K17	Load Balancer	Lot	1				
K18	Firewall with IPS	Lot	1				
K19	Data Storage	Lot	1				
K20	SAN Switch	Lot	1				
K21	Network Switch -Level 3	Lot	1				
K22	Network Switch -Level 2	Lot	1				
K23	Web Application Firewall (WAF) Appliance + DDOS Protection	Lot	1				
K24	Tape Drive	No	1				
K25	Cartridge Magazine	Lot	1				
vi	Hardware components for Control Centre	-	-				
K26	Video Wall Panel, with Controller, 70" (3x3)	No	1				
K27	Video Wall Switcher	No	1				
K28	Network LaserJet Printer - A3 & A4 paper	No	1				
K29	All in One Printer (Color Print, Copy, FAX)	No	1				
K30	Workstation for CAD/AVL & PIS with 21" dual Monitor	Nos	22				
K31	Technical Support Team Laptop	Nos	4				
vii	Software Components at Data Centre	-	-				
K32	Video wall management Software	Lot	1				
K33	Virtualization Software	Lot	1				
K34	Centralized Antivirus Software	Lot	1				
K35	Backup software	Lot	1				
K36	CAL, OS, database license as per design, other software	Lot	1				
viii	Network Bandwidth	-	-				

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				Unit Rate	Amount	Unit Rate	Amount
(1)	(2)	(3)	(4)	(5)	(4)x(5)	(6)	(4)x(6)
	CBS Network Backbone	-	-				
K37	Primary Connectivity (Mpls or Leased line)	Lot	1				
K38	Secondary Connectivity (Mpls or Leased line)	Lot	1				
ix	Mandatory Spare Parts						
K39	L3 Switch (Copper + OFC)	Nos	1				
K40	LEVEL 2 Switch (48 Port)	Nos	1				
K41	SAN-SW	Nos	1				
K42	Land Line Phone	Nos	1				
K43	Hands free/Headphone for dispatchers	Nos	1				
x	Other Items	-	-				
K44	Other items required to meet the RFP requirements of CBS-CCC	Lot	1				
	Subtotal of CBS Command Control Centre (CBS-CCC)						
	Total (Sum of item 201 to 211)						
	(Total carried forward to Schedule No.2: Supply of Plant/Equipment and Spare parts)						

Name of Tenderer

Signature of Tenderer

Date

(Bidder shall not quote in any case the Unit Rate of Mandatory Spare parts of a particular line item less than Unit Rate of Main equipment line item as indicated in the Break Down of Price schedule No.2

If any such discrepancy is found during the price bid evaluation process the bid is liable for rejection and no further communication shall be entertained.)

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Annexure 1-7

Break Down of Price Schedule No.3

Item No.	Description	Unit	Qty	Foreign Currency (*)		Indian Rupees (Rs)	
				Unit Rate	Amount	Unit Rate	Amount
(1)	(2)	(3)	(4)	(5)	(4) x (5)	(6)	(4)x(6)
301	Chennai Traffic Information & Management System Command Control Centre (TIMS-CCC)	-	-	-	-	-	-
A1	Installation to meet functional requirement	Location	1				
A2	Test and Commissioning	Location	1				
A3	Third party system security audit before commissioning test (for ATCS and TIMS)	No	1				
A4	Third party system security audit for every year during O&M period (for ATCS and TIMS)	Nos	5				
A5	Training	Lot	1				
A6	Safety measures items	Lot	1				
A7	Shifting charge for Control Centre	Lot	1				
A8	Other items required to meet the RFP requirements of TIMS-CCC	Lot	1				

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Item No.	Description	Unit	Qty	Foreign Currency (*)		Indian Rupees (Rs)	
				Unit Rate	Amount	Unit Rate	Amount
(1)	(2)	(3)	(4)	(5)	(4) x (5)	(6)	(4)x(6)
	Subtotal of Chennai Traffic Information & Management System (TIMS-CCC)						
302	Adaptive Traffic Control System (ATCS)	-	-	-	-	-	-
B1	Installation including power supply, cabling and wiring, grounding/earthing, protection against lightning, cabinet/junction box, support structure, radio interference, road signs and markings and necessary civil works etc to meet the functional requirement	Location	165				
B2	Test and Commissioning	Location	165				
B3	Training	Lot	1				
B4	Safety measures items	Lot	1				
B5	Other items required to meet the RFP requirements of ATCS		1				
	Subtotal of Adaptive Traffic Control System (ATCS)						

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Item No.	Description	Unit	Qty	Foreign Currency (*)		Indian Rupees (Rs)	
				Unit Rate	Amount	Unit Rate	Amount
(1)	(2)	(3)	(4)	(5)	(4) x (5)	(6)	(4)x(6)
303	Traffic Incident Detection System (TIDS)	-	-	-	-	-	-
C1	Installation including power supply, cabling and wiring, grounding/earthing, protection against lightning, cabinet/junction box, support structure, radio interference, road signs and markings and necessary civil works etc to meet the functional requirement	Location	58				
C2	Test and Commissioning	Location	58				
C3	Training	Lot	1				
C4	Safety measures items	Lot	1				
C5	Other items required to meet the RFP requirements of TIDS		1				
	Subtotal of Traffic Incident Detection System (TIDS)						
304	Variable Message Sign System (VMS)	-	-	-	-	-	-
D1	Installation including power supply, cabling and wiring, grounding/earthing, protection	Location	17				

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Item No.	Description	Unit	Qty	Foreign Currency (*)		Indian Rupees (Rs)	
				Unit Rate	Amount	Unit Rate	Amount
(1)	(2)	(3)	(4)	(5)	(4) x (5)	(6)	(4)x(6)
	against lightning, cabinet/junction box, support structure, radio interference, road signs and markings and necessary civil works etc to meet the functional requirement						
D2	Test and Commissioning	Location	17				
D3	Training	Lot	1				
D4	Safety measures items	Lot	1				
D5	Other items required to meet the RFP requirements of VMS		1				
	Subtotal of Variable Message Sign System (VMS)						
305	Speed Limit Violation Detection System (SLVD)	-	-	-	-	-	-
E1	Installation including power supply, cabling and wiring, grounding/earthing, protection against lightning, cabinet/junction box, support structure, radio interference, road signs and markings and necessary civil works	Location	11				

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Item No.	Description	Unit	Qty	Foreign Currency (*)		Indian Rupees (Rs)	
				Unit Rate	Amount	Unit Rate	Amount
(1)	(2)	(3)	(4)	(5)	(4) x (5)	(6)	(4)x(6)
	etc to meet the functional requirement						
E2	Test and Commissioning	Location	11				
E3	Training	Lot	1				
E4	Safety measures items	Lot	1				
E5	Other items required to meet the RFP requirements of SLVD		1				
	Subtotal of Speed Limit Violation Detection System (SLVD)						
306	Red Light Violation Detection System (RLVD)	-	-	-	-	-	-
F1	Installation including power supply, cabling and wiring, grounding/earthing, protection against lightning, cabinet/junction box, support structure, radio interference, road signs and markings and necessary civil works etc to meet the functional requirement	Location	50				
F2	Test and Commissioning	Location	50				
F3	Training	Lot	1				

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Item No.	Description	Unit	Qty	Foreign Currency (*)		Indian Rupees (Rs)	
				Unit Rate	Amount	Unit Rate	Amount
(1)	(2)	(3)	(4)	(5)	(4) x (5)	(6)	(4)x(6)
F4	Safety measures items	Lot	1				
F5	Other items required to meet the RFP requirements of RLVD		1				
	Subtotal of Red-Light Violation Detection System (RLVD)						
307	Automatic Traffic Cum-Classifier (ATCC)	-	-	-	-	-	-
G1	Installation including power supply, cabling and wiring, grounding/earthing, protection against lightning, cabinet/junction box, support structure, radio interference, road signs and markings and necessary civil works etc to meet the functional requirement	Location	171				
G2	Test and Commissioning	Location	171				
G3	Training	Lot	1				
G4	Safety measures items	Lot	1				
G5	Other items required to meet the RFP requirements of ATCC		1				

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Item No.	Description	Unit	Qty	Foreign Currency (*)		Indian Rupees (Rs)	
				Unit Rate	Amount	Unit Rate	Amount
(1)	(2)	(3)	(4)	(5)	(4) x (5)	(6)	(4)x(6)
	Subtotal of Automatic Traffic Cum-Classifier (ATCC)						
308	Computer Aided Dispatch/ Automatic Vehicle Location System (CAD/AVL)	-	-	-	-	-	-
H1	Installation including cabling and wiring, etc to meet functional requirement	Bus	2940				
H2	Test and Commissioning	Bus	2940				
H3	Training	Lot	1				
H4	Safety measures items	Lot	1				
H5	Other itmes required to meet the RFP requirements of CAD/AVL		1				
	Subtotal of Computer Aided Dispatch/ Automatic Vehicle Location System (CAD/AVL)						
309	Passenger Information System (PIS)	-	-	-	-	-	-
I1	Installation including power supply, cabling and wiring, grounding/earthing, protection against lightning, cabinet/junction box, support structure, radio	Location	616				

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Item No.	Description	Unit	Qty	Foreign Currency (*)		Indian Rupees (Rs)	
				Unit Rate	Amount	Unit Rate	Amount
(1)	(2)	(3)	(4)	(5)	(4) x (5)	(6)	(4)x(6)
	interference, road signs and markings and necessary civil works etc to meet the functional requirement						
I2	Test and Commissioning	Location	616				
I3	Training	Lot	1				
I4	Safety measures items	Lot	1				
I5	Other items required to meet the RFP requirements of PIS		1				
	Subtotal of Passenger Information System (PIS)						
310	Depot Management System (DMS)	-	-	-	-	-	-
J1	Installation to meet the functional requirement	Location	31				
J2	Test and Commissioning	Location	31				
J3	Training	Lot	1				
J4	Safety measures items	Lot	1				
J5	Any other hardware or software required to meet the RFP requirements of		1				

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Item No.	Description	Unit	Qty	Foreign Currency (*)		Indian Rupees (Rs)	
				Unit Rate	Amount	Unit Rate	Amount
(1)	(2)	(3)	(4)	(5)	(4) x (5)	(6)	(4)x(6)
	Subtotal of Depot Management System (DMS)						
311	CBS Command Control Centre (CBS-CCC)	-	-	-	-	-	-
K1	Installation to meet the functional requirement	Location	1				
K2	Test and Commissioning	Location	1				
K3	Third party system security audit before commissioning test (for CBS)	No	1				
K4	Third party system security audit for every year during O&M period (for CBS)	Nos	5				
K5	Training	Lot	1				
K6	Safety measures items	Lot	1				
K7	Other items required to meet the RFP requirements of CBS-CCC		1				
	Subtotal of CBS Command Control Centre (CBS-CCC)						
	Total (Sum of item 301 to 311)						

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Item No.	Description	Unit	Qty	Foreign Currency (*)		Indian Rupees (Rs)	
				Unit Rate	Amount	Unit Rate	Amount
(1)	(2)	(3)	(4)	(5)	(4) x (5)	(6)	(4)x(6)
	(Total carried forward to Schedule No.3: On site Installation, Training and Testing)						

Name of Tenderer

Signature of Tenderer

Date

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Annexure 1-8

Form of Power of Attorney for Lead Member of JV

Whereas the Chennai Smart City Limited ("Employer") has invited bids from interested parties for the Installation of Chennai Metropolitan Area Intelligent Transport Systems ("the Project").

Whereas,,, and (Collectively the "JV") being Members of the JV are interested in bidding for the Project in accordance with the terms and conditions of the Request for Proposal and other connected documents in respect of the Project, and

Whereas, it is necessary for the Members of the JV to designate one of them as the Lead Member with all necessary power and authority to do for and on behalf of the JV, all acts, deeds and things as may be necessary in connection with the JV bid for the Project and its execution.

NOW THEREFORE KNOW ALL MEN BY THESE PRESENTS

We, M/s. having our registered office at , M/s., having our registered office at , M/s., having our registered office at , and M/s., having our registered office at (hereinafter collectively referred to as the "Principals") do hereby irrevocably designate, nominate, constitute, appoint and authorise M/s....., having its registered office at, being one of the Members of the JV, as the Lead Member and true and lawful attorney of the JV (hereinafter referred to as the "Attorney") and hereby irrevocably authorise the Attorney (with power to sub-delegate) to conduct all business for and on behalf of the JV and any one of us during the bidding process and, in the event the JV is awarded the Contract, during the execution of the Project, and in this regard, to do on our behalf and on behalf of the JV, all or any of such acts, deeds or things as are necessary or required or incidental to the submission of its bid for the Project, including but not limited to signing and submission of all applications, bids and other documents and writings, accept the Letter of Award, participate in bidders' and other conferences, respond to queries, submit information/ documents, sign and execute contracts and undertakings consequent to acceptance of the bid of the JV and generally to represent the JV in all its dealings with the Employer, and/ or any other Government Agency or any person, in all matters in connection with or relating to or arising out of the JV's bid for the Project and/ or upon award thereof till the Contract is entered into with the Employer and Completed.

AND hereby agree to ratify and confirm and do hereby ratify and confirm all acts, deeds and things done or caused to be done by our said Attorney pursuant to and in exercise of the powers conferred by this Power of Attorney and that all acts, deeds and things done by our said Attorney in exercise of the powers hereby conferred shall and shall always be deemed to have been done by us/ JV.

IN WITNESS WHEREOF WE THE PRINCIPALS ABOVE NAMED HAVE EXECUTED THIS POWER OF ATTORNEY ON THIS [date in words] DAY OF [month] [year in 'yyyy' format].

For

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(Signature, Seal, Name, Title & Address)

For

(Signature, Seal, Name, Title & Address)

For

(Signature, Seal, Name, Title & Address)

For

(Signature, Seal, Name, Title & Address)

Witnesses:

1.

2.

Notes:

- *The mode of execution of the Power of Attorney should be in accordance with the procedure, if any, laid down by the applicable law and the charter documents of the executant(s) and when it is so required, the same should be under company seal affixed in accordance with the required procedure. **The Power of Attorney should be executed on a non-judicial stamp paper of appropriate denomination and should be duly notarised by a notary public.***
- *Wherever required, the Bidder should submit for verification the extract of the charter documents and documents such as a resolution/ power of attorney in favour of the person executing this Power of Attorney for the delegation of power hereunder on behalf of the Bidder.*

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Annexure 1-9

Form of Bid Security (Bank Guarantee)

[Guarantor letterhead or SWIFT identifier code]

Beneficiary: *Chennai Smart City Limited (CSCL)*

5th Floor, Amma Maligai, Ripon Buildings, Chennai - 600003,
Tamil Nadu

IFB No.: *[C.S.C.LC.No.145/2017-18]*

Date: *[insert date of issue]*

BID GUARANTEE No.: *[insert guarantee reference number]*

Guarantor: *[insert name and address of place of issue, unless indicated in the letterhead]*

We have been informed that *[insert name of the Bidder (single entity) or all the names of JV members (hereinafter called “the Applicant”)]* has submitted or will submit to the Beneficiary its Bid (hereinafter called “the Bid”) for the execution of *[insert description of Contract]* under Loan Agreement No. *[insert Loan Agreement Number]*.

Furthermore, we understand that, according to the Beneficiary’s conditions, Bids must be supported by a bid guarantee.

At the request of the Applicant, we, as Guarantor, hereby irrevocably undertake to pay the Beneficiary any sum or sums not exceeding in total an amount of One Hundred Millions INR (INR. 100 millions), or equivalent in USD upon receipt by us of the Beneficiary’s complying demand, supported by the Beneficiary’s statement, whether in the demand itself or a separate signed document accompanying or identifying the demand, stating that either the Applicant:

- (a) has withdrawn its Bid during the period of Bid validity set forth in the Applicant’s Letter of Bid (hereinafter called “the Bid Validity Period”), or any extension thereto provided by the Applicant; or
- (b) having been notified of the acceptance of its Bid by the Beneficiary during the Bid Validity Period or any extension thereto provided by the Applicant, (i) fails to execute the Contract Agreement, or (ii) fails to furnish the Performance Security, in accordance with the Instructions to Bidders of the Beneficiary’s Bidding Documents.

This guarantee will expire and shall be returned to the Applicant: (a) if the Applicant is the successful Bidder, upon our receipt of copies of the Contract Agreement signed by the Applicant and the Performance Security issued to the Beneficiary in relation to such Contract Agreement; or (b) if the Applicant is not the successful Bidder, upon the earlier of (i) our receipt of a copy of the Beneficiary’s notification to the Applicant of the results of the bidding process; or (ii) twenty-eight (28) days after the end of the Bid Validity Period.

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Consequently, any demand for payment under this guarantee must be received by us at the office indicated above on or before that date.

This guarantee is subject to the Uniform Rules for Demand Guarantees, ICC Publication No. 458¹.

[signature(s)]

[Note: All italicized text is for use in preparing this form and shall be deleted from the final product.]

¹ As the case may be, ICC Publication No. 758 (or subsequent ICC Publications) may be used. In such cases, modify the Publication number.

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Annexure 1-10

Form of JV Agreement

(To be executed on Stamp paper of appropriate value)

THIS JOINT BIDDING AGREEMENT is entered into on this the day of 20 ...

AMONGST

1. {..... Limited, and having its registered office at} (hereinafter referred to as the "**First Part**" which expression shall, unless repugnant to the context include its successors and permitted assigns)

AND

2. {..... Limited, having its registered office at} and (hereinafter referred to as the "**Second Part**" which expression shall, unless repugnant to the context include its successors and permitted assigns)

AND

3. {..... Limited, and having its registered office at} (hereinafter referred to as the "**Third Part**" which expression shall, unless repugnant to the context include its successors and permitted assigns)

AND

4. {..... Limited, and having its registered office at} (hereinafter referred to as the "**Fourth Part**" which expression shall, unless repugnant to the context include its successors and permitted assigns)

The above-mentioned parties of the FIRST, {SECOND, THIRD and FOURTH} PART are collectively referred to as the "**Parties**" and each is individually referred to as a "**Party**"

WHEREAS,

- (A) THE CHENNAI SMART CITY LIMITED, established under the XXXXXXXXXXXXXXXXXXXX, represented by its XXXXXXXX and having its principal offices XXXXXXXXXXXXXXXX (hereinafter referred to as the "**Employer**" which expression shall, unless repugnant to the context or meaning thereof, include its administrators, successors and assigns) has invited bids (the "**Bids**") by its Request for Proposal No (the "**RFP**") for award of contract for " Installation of Chennai Metropolitan Area Intelligent Transport Systems " (the "**Project**").
- (B) The Parties are interested in jointly bidding for the Project as members of a JV and in accordance with the terms and conditions of the RFP document and other bid documents in respect of the Project, and
- (C) It is a necessary condition under the RFP document that the members of the JV shall

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enter into a Joint Bidding Agreement and furnish a copy thereof with the Bid.

NOW IT IS HEREBY AGREED as follows

1. Definitions and Interpretations

In this Agreement, the capitalized terms shall, unless the context otherwise requires, have the meaning ascribed thereto under the RFP.

2. Joint Venture

- 2.1 The Parties do hereby irrevocably constitute a JV (the "JV/ Consortium") for the purposes of jointly participating in the Bidding Process for the Project.
- 2.2 The Parties hereby undertake to participate in the Bidding Process only through this JV and not individually and/ or through any other JV constituted for this Project, either directly or indirectly or through any of their Associates.

3. Covenants

The Parties hereby undertake that in the event the Joint Venture is declared the selected Bidder and awarded the Project, it shall enter into an Contract Agreement with the Authority for performing all its obligations as the Service Provider in terms of the Contract Agreement for the Project.

4. Role of the Parties

The Parties hereby undertake to perform the roles and responsibilities as described below:

- (a) Party of the First Part shall be the Lead member of the Joint Venture and shall have the power of attorney from all Parties for conducting all business for and on behalf of the Joint Venture during the Bidding Process and till the completion of Project as per Contract Agreement;
- (b) Party of the Second Part shall be {the ____ Member of the Joint Venture;}
- (c) Party of the Third Part shall be {the ____ Member of the Joint Venture;}
- (d) Party of the Fourth Part shall be the ____ Member of the Joint Venture; and}

5. Joint and Several Liability

The Parties do hereby undertake to be jointly and severally responsible for all obligations and liabilities relating to the Project and in accordance with the terms of the RFP and the Contract Agreement, till such time as the completion of the Project is achieved under and in accordance with the Contract Agreement.

6. Stakes in the JV

The Parties agree that the proportion of stakes among the Parties in the JV shall be as follows:

First Party:

Second Party:

Third Party

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Fourth Party:

7. Representation of the Parties

Each Party represents to the other Parties as of the date of this Agreement that:

- (a) Such Party is duly organised, validly existing and in good standing under the laws of its incorporation and has all requisite power and authority to enter into this Agreement;
- (b) The execution, delivery and performance by such Party of this Agreement has been authorised by all necessary and appropriate corporate or governmental action and a copy of the extract of the charter documents and board resolution/ power of attorney in favour of the person executing this Agreement for the delegation of power and authority to execute this Agreement on behalf of the JV Member is annexed to this Agreement, and will not, to the best of its knowledge:
 - (i) require any consent or approval not already obtained;
 - (ii) violate any Applicable Law presently in effect and having applicability to it;
 - (iii) violate the memorandum and articles of association, by-laws or other applicable organisational documents thereof;
 - (iv) violate any clearance, permit, concession, grant, license or other governmental authorisation, approval, judgement, order or decree or any mortgage agreement, indenture or any other instrument to which such Party is a party or by which such Party or any of its properties or assets are bound or that is otherwise applicable to such Party; or
 - (v) create or impose any liens, mortgages, pledges, claims, security interests, charges or Encumbrances or obligations to create a lien, charge, pledge, security interest, encumbrances or mortgage in or on the property of such Party, except for encumbrances that would not, individually or in the aggregate, have a material adverse effect on the financial condition or prospects or business of such Party so as to prevent such Party from fulfilling its obligations under this Agreement;
- (c) this Agreement is the legal and binding obligation of such Party, enforceable in accordance with its terms against it; and
- (d) there is no litigation pending or, to the best of such Party's knowledge, threatened to which it or any of its Affiliates is a party that presently affects or which would have a material adverse effect on the financial condition or prospects or business of such Party in the fulfilment of its obligations under this Agreement.

8. Termination

This Agreement shall be effective from the date hereof and shall continue in full force and effect until completion of the Project is achieved under and in accordance with the Contract Agreement, in case the Project is awarded to the JV. However, in case the JV is either not qualified for the Project or does not get selected for award of the Project, the Agreement will stand terminated in case the Bidder is not qualified or upon return of the Bid Security by the Employer to the Bidder, as the case may be.

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9. Miscellaneous

9. 1 This Joint Bidding Agreement shall be governed by laws of India.
9. 2 The Parties acknowledge and accept that this Agreement shall not be amended by the Parties without the prior written consent of the Employer.

IN WITNESS WHEREOF THE PARTIES ABOVE NAMED HAVE EXECUTED AND DELIVERED THIS AGREEMENT AS OF THE DATE FIRST ABOVE WRITTEN.

SIGNED, SEALED AND DELIVERED

For and on behalf of LEAD MEMBER by:

(Signature)

(Name)

(Designation)

(Address)

SIGNED, SEALED AND DELIVERED

For and on behalf of SECOND PART

(Signature)

(Name)

(Designation)

(Address)

SIGNED, SEALED AND DELIVERED

For and on behalf of

THIRD PART

(Signature)

(Name)

(Designation)

(Address)

SIGNED, SEALED AND DELIVERED

For and on behalf of

FOURTH PART

(Signature)

(Name)

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(Designation)

(Address)

In the presence of:

1.

2.

Notes:

1. *The mode of the execution of the Joint Bidding Agreement should be in accordance with the procedure. if any, laid down by the Applicable Law and the charter documents of the executant(s) and when it is so required, the same should be under company seal affixed in accordance with the required procedure. **The Power of Attorney should be executed on a non-judicial stamp paper of appropriate denomination and should be duly notarised by a notary public.***
2. *Each Joint Bidding Agreement should attach a copy of the extract of the charter documents and documents such as resolution / power of attorney in favour of the person executing this Agreement for the delegation of power and authority to execute this Agreement on behalf of the Joint Venture Member.*

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Annexure 2-1

6.2 Contractor's Personnel

Table 6-1: Requirement of Contractor's Personnel- Page No. ER-36

S. No.	Position	Key Staff / Non-Key Staff	International/ Local	Minimum Staff	Project Phase, Fulltime /Intermittent	Educational Qualification & Experience	Role & Responsibility
1	Project Director	Key Staff	International	1	Implementation and O&M Fulltime	Education: - Graduate in Civil/Electronics/ Computer Science/or equivalent - Post-Graduation in Management/ Civil/ Electronics/Equivalent Experience: - Total Work Experience; 15 years - Experience in Similar ITS projects; 10 years - Experience as Project Director in Similar project of at least 10 million USD covering end to end installations; 1 Project -Experience in coordinating with Central/ State/ Local Government agencies in urban infrastructure - International experience in similar project(s) - Experience in similar project which	<ul style="list-style-type: none"> • Responsible for the overall performance of the project • Primary representative of the Contractor and Coordinate with Stakeholders on contractual negotiations and administration. • Primary contact for warranty and ongoing support services. • Managing the team members. • Submission of Invoices. • It is presumed that Project Director has considerable and reasonable power to take informed decisions for smooth delivery of the project. •Responsible for Communications, Outreach, and Knowledge Management Activity

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S. No.	Position	Key Staff / Non-Key Staff	International/ Local	Minimum Staff	Project Phase, Fulltime /Intermittent	Educational Qualification & Experience	Role & Responsibility
						includes any of the below mentioned systems in each project; 3 projects 1.Area Traffic Signal Control System 2.Traffic Management & Information System 3.CAD/AVL system 4.ICT Infrastructure or City / Campus wide System 5.Command Control Centre 6.ICT	
2	Project Manager TIMS and ATCS	Key Staff	Local	1	Implementation and O&M Fulltime	Education: - Graduate in Civil/Electronics/ Computer Science /or equivalent - Post-Graduation in Management/ Civil/ Electronics/Equivalent Experience: - Total Work Experience; 12 years minimum - Experience in Similar ITS/ICT projects and involved in end-to-end implementation ; 8 years - Experience as Project Manager in Similar project of at least 1 million USD covering end to end installations; 1	<ul style="list-style-type: none"> • Responsible for the overall performance of TIMS • Primary interface for all technical questions and for coordinating with Contractor's developer and technical staff. • Responsible for the design, development, and procurement of all hardware, Software and Training under the proposed contract. • Meeting with Stakeholder • Managing the team members • Ensuring the project timeline being followed • SLA Management • Insurance Coordination

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S. No.	Position	Key Staff / Non-Key Staff	International/ Local	Minimum Staff	Project Phase, Fulltime /Intermittent	Educational Qualification & Experience	Role & Responsibility
						Project -Experience in coordinating with Central/ State/ Local Government agencies in urban infrastructure - Experience in similar project which includes any of the below mentioned systems in each project; 3 projects 1.Area Traffic Signal Control System 2.Traffic Management & Traveller Information System 3.ICT Infrastructure or City / Campus wide System 4.Command Control Centre	
3	Project Manager CBS	Key Staff	Local	1	Implementation and O&M Fulltime	Education: - Graduate in Civil/Electronics/ Computer Science/or equivalent - Post-Graduation in Management/ Civil/ Electronics/Equivalent Experience: - Total Work Experience; 12 years minimum - Experience in Similar ITS/ICT projects and involved in end-to-end implementation ; 8 years	<ul style="list-style-type: none"> • Responsible for the overall performance of CBS • Primary interface for all technical questions and for coordinating with Contractor's developer and technical staff. • Responsible for the design, development, and procurement of all hardware, Software and Training under the proposed contract. • Meeting with Stakeholders • Managing the team members • Ensuring the project timeline being followed

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S. No.	Position	Key Staff / Non-Key Staff	International/ Local	Minimum Staff	Project Phase, Fulltime /Intermittent	Educational Qualification & Experience	Role & Responsibility
						- Experience as Project Manager in Similar project of at least 1 million USD covering end to end installations;; 1 Project -Experience in coordinating with Central/ State/ Local Government agencies in urban infrastructure - Experience in similar project which includes any of the below mentioned systems in each project; 3 projects 1. CAD/AVL system 2. Public Transit Infrastructure 3. Command Control Centre 4. Depot Management 5. PIS System Experience	<ul style="list-style-type: none"> • SLA Management • Insurance Coordination

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S. No.	Position	Key Staff / Non-Key Staff	International/ Local	Minimum Staff	Project Phase, Fulltime /Intermittent	Educational Qualification & Experience	Role & Responsibility
4	ATCS Expert - International	Key Staff	International	1	Implementation and O&M Intermittent	Education: - Graduate in Civil/Electronics/ Computer Science/or equivalent Experience: - Total Work Experience; 12 years minimum - Experience in traffic signalling projects, preferably adaptive traffic signalling projects ; 8 years - International Experience in Area Traffic Signal Control with subarea formulation of minimum 500 traffic signal in total - Experience in Area Traffic Signal Control projects; 3 projects	<ul style="list-style-type: none"> • Primary interface for all technical matter on ATCS and for coordinating with Contractor's developer and technical staff. • Responsible for the design, development, and procurement of all hardware, Software and Training under the proposed contract. • Provide international expertise to ensure best practices are incorporated in current implementation and operations. • Provide international expertise to ensure best practices are incorporated in current implementation and operations. • Managing ATCS Implementation • Meeting with Stakeholder • Procurement of software and hardware • Ensuring the project timeline being followed • SLA Management
5	TIMS Expert - International	Key Staff	International	1	Implementation and O&M Intermittent	Education:- Graduate in Civil/Electronics/ Computer Science/or equivalent	<ul style="list-style-type: none"> •Primary interface for all technical matters on ITMS and for coordinating with Contractor's developer and technical staff. •Responsible for the design, development, and procurement of all

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S. No.	Position	Key Staff / Non-Key Staff	International/ Local	Minimum Staff	Project Phase, Fulltime /Intermittent	Educational Qualification & Experience	Role & Responsibility
						Experience:- -Total Work Experience; 12 years minimum - Experience in designing, implementing and integrating multiple Traffic Information & Management systems, 8 years - International Experience in TIMS project of integration with central platform of minimum 1000 IoT devices in total - Experience in TIMS projects.; 3 projects.	hardware, Software and Training under the proposed contract. <ul style="list-style-type: none"> • Provide international expertise to ensure best practices are incorporated in current implementation and operations • Managing TIMS Implementation • Meeting with Stakeholder • Procurement of software and hardware • Ensuring the project timeline being followed • SLA Management
6	CBS Expert - International	Key Staff	International	1	Implementation and O&M Intermittent	Education: - Graduate in Civil/Electronics/ Computer Science/or equivalent Experience: - Total Work Experience; 12 years minimum - Experience in CAD/AVL projects 8 years - Experience in CAD/AVL project of at minimum 1000 buses (public	<ul style="list-style-type: none"> • Primary interface for all technical matter on CBS and for coordinating with Contractor's developer and technical staff. • Responsible for the design, development, and procurement of all hardware, Software and Training under the proposed contract. • Provide international expertise to ensure best practices are incorporated in current implementation and operations. • Managing CBS Implementation

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S. No.	Position	Key Staff / Non-Key Staff	International/ Local	Minimum Staff	Project Phase, Fulltime /Intermittent	Educational Qualification & Experience	Role & Responsibility
						transport) in total - Experience in CAD/AVL projects; 3 projects	<ul style="list-style-type: none"> • Meeting with Stakeholder • Procurement of software and hardware • Ensuring the project timeline being followed • SLA Management
7	ATCS Expert - Local	Key Staff	Local	1	Implementation and O&M Fulltime	Education: - Graduate in Civil/Electronics/ Computer Science/or equivalent Experience: - Total Work Experience; 10 years - Experience in minimum 250 traffic signal in total - Experience in Traffic Signal Control of at least 0.5 million USD covering end to end installations; 1 Project - Experience in Adaptive Area Traffic Signal Control projects; 3 projects	<ul style="list-style-type: none"> • Interface to assist ATCS Expert - International for all technical questions and for coordinating with Contractor's developer and technical staff. • Responsible for the design, development, and procurement of all hardware under the proposed contract.

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S. No.	Position	Key Staff / Non-Key Staff	International/ Local	Minimum Staff	Project Phase, Fulltime /Intermittent	Educational Qualification & Experience	Role & Responsibility
8	TIMS Expert - Local	Key Staff	Local	1	Implementation and O&M Fulltime	Education: - Graduate in Civil/Electronics/ Computer Science/or equivalent Experience: - Total Work Experience; 10 years - Experience in TIMS project of integration with central platform of minimum 500 IoT devices in total - Experience in TIMS of at least 0.5 million USD covering end to end installations; 1 Project - Experience in TIMS projects; 3 projects	<ul style="list-style-type: none"> • Interface to assist TIMS Expert - International for all technical questions and for coordinating with Contractor's developer and technical staff. • Responsible for the design, development, and procurement of all hardware under the proposed contract.
9	CBS Expert - Local	Key Staff	Local	1	Implementation and O&M Fulltime	Education: - Graduate in Civil/Electronics/ Computer Science/or equivalent Experience: - Total Work Experience; 10 years - Experience in CAD/AVL projects CAD/AVL project of minimum 500 buses (public transport) in total. - Experience in CBS of at least 0.5	<ul style="list-style-type: none"> • Interface to assist CBS Expert - International for all technical questions and for coordinating with Contractor's developer and technical staff. • Responsible for the design, development, and procurement of all hardware under the proposed contract. • . Coordination with Urban Engineer for better traffic planning

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S. No.	Position	Key Staff / Non-Key Staff	International/ Local	Minimum Staff	Project Phase, Fulltime /Intermittent	Educational Qualification & Experience	Role & Responsibility
						million USD covering end to end installations; 1 Project - Experience in CBS projects; 3 projects 1. CAD/AVL system 2. Public Transit Infrastructure 3. Command Control Centre 4. Depot Management 5. PIS System Experience	
10	Operations Manager CBS	Key Staff	Local	1	O&M Fulltime	Education: - Graduate degree Experience: -Total Work Experience: 10 years -Indian bus operation experience with in-depth knowledge of bus agencies and their systems. -Good understanding of ITS implementation for bus agencies with 7 years.	<ul style="list-style-type: none"> • Provide bus operations expertise from Indian agencies to ensure operational requirements and subsequent implementation of project requirements
11	Safety Infrastructure Specialist	Key Staff	Local	1	Implementation and O&M	Education: - Graduate in Civil/or equivalent	<ul style="list-style-type: none"> • Establish Safety Plan • Ensure field safety during Implementation.

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S. No.	Position	Key Staff / Non-Key Staff	International/ Local	Minimum Staff	Project Phase, Fulltime /Intermittent	Educational Qualification & Experience	Role & Responsibility
					Fulltime	Experience: -Total Work Experience; 10 years -Experience in Similar Works as Safety Engineer; 7 years	<ul style="list-style-type: none"> • Ensure Traffic diversion and safety measures.
12	Quality Control Engineer	Key Staff	Local	1	Implementation and O&M Fulltime	Education: - Graduate in Civil/Electronics/Computer Science/or equivalent Experience: - Total Work Experience; 10 years - Experience in designing and implementing Quality Assurance and Quality Control processes; 7 years - Experience in relevant projects; 2 projects	<ul style="list-style-type: none"> • Publish Quality Control Plan • Assist ITS team to do quality control of development, the products and assembly and works at site. • Prepare and Maintain quality control report, which will include quality control monitoring data, site status and if any.
13	Finance Manager	Key Staff	Local	1	Implementation and O&M Fulltime	Education: - Graduate in commerce /CA/CFA/MBA Finance Experience: -Total Work Experience; 10 years	<ul style="list-style-type: none"> • Primary interface for all Financial Matters • Prepare and submit Invoice • Assisting Project Manager on accounts

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S. No.	Position	Key Staff / Non-Key Staff	International/ Local	Minimum Staff	Project Phase, Fulltime /Intermittent	Educational Qualification & Experience	Role & Responsibility
						-Experience in Similar Works as Accounts/Finance; 7 years -Experience in relevant projects: 2 projects	
14	Traffic/Transportation Engineer/ Planner	Key Staff	Local	1	Implementation and O&M Fulltime	Education: - Graduate in Civil/ Architecture/ equivalent -Masters in Transportation/or Planning/ Urban design/ Infrastructure or equivalent Engineering Experience: -Total Work Experience; 10 years -Experience in Similar Works as Traffic/Transportation Engineer; 7 years -Experience in relevant projects: 2 projects	<ul style="list-style-type: none"> Investigate traffic conditions and analyse the appropriate action plan for traffic, signal performance and infrastructure improvement Monitor performance and assist client to handle the operations smoothly on Traffic/Transportation. Creating and updating Signal plan and route diversion plans. Suggest measures to the stakeholders to improvise the traffic flow in the CMA on regular basis. Suggest measures to reduce accidents (yearly, monthly, Quarterly). Responsible for day-to-day traffic planning and operations

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S. No.	Position	Key Staff / Non-Key Staff	International/ Local	Minimum Staff	Project Phase, Fulltime /Intermittent	Educational Qualification & Experience	Role & Responsibility
							<ul style="list-style-type: none"> Define the Policy for Traffic movement as per available resources and information collected from ITS system
15	Urban Planner/ Engineer/ Designer	Non Key Staff	Local	1	Implementation Intermittent	Education: - Graduate in Civil/ Architecture/ Equivalent -Masters in Transportation/or Planning/ Urban design/ Infrastructure or equivalent Experience: -Total Work Experience; 10 years -Experience in Similar Works as Urban Planner/ Designer/ Engineer; 7 years	<ul style="list-style-type: none"> Review and prepare the plans and designs for junction improvement' Suggest measures to improve the traffic flow. Create traffic flow patterns / Designs as required. Assist CTP and Traffic / Transport planner with required designs.
16	Data Analyst	Non-Key Staff	Local	1	Implementation and O&M Intermittent	Education: - Graduate in Electronics /Computer Science/or equivalent Experience: -Total Work Experience; 7 years -Experience in Similar Works as Data Centre Expert/Data Science, of large-	<ul style="list-style-type: none"> Control room and Data centre (Cloud) management Asset management of all IT Hardware/device and Non-IT items. Troubleshooting related to server, data base Expert in data mining and analysis <ul style="list-style-type: none"> Hadoop, or Edge Analytics, or

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S. No.	Position	Key Staff / Non-Key Staff	International/ Local	Minimum Staff	Project Phase, Fulltime /Intermittent	Educational Qualification & Experience	Role & Responsibility
						scale distributed and heterogeneous IT systems with 5 years experience ;	<ul style="list-style-type: none"> • Equivalent Platform • Strong Database skills including Oracle, SQL Server, etc. • Demonstrated skills in real-time analytics, Big Data, Machine Learning for pattern recognition and predictive analysis
17	Solution Architect / Maintenance Manager	Non-Key Staff	Local	1	Implementation and O&M Intermittent	Education:- Graduate in Civil/ Electronics/ Computer Science /or equivalent Experience:- Total Work Experience; 7 years- Experience in similar works as solution Architect; 5 years. - Experience in relevant projects; 2 projects	<ul style="list-style-type: none"> • Ensure that the solution is architected to support the needs of the project. • Understanding functional requirements to meet the operational need. • System Integration/ Hardware Interface between OEM and development team.
18	Data/Command Centre Expert/System Administrator	Non-Key Staff	Local	1	Implementation and O&M Intermittent	Education: - Graduate in Electronics /Computer Science/or equivalent	<ul style="list-style-type: none"> • Control room and Data centre (Cloud) management • Asset management of all IT Hardware/device and Non-IT items. • Troubleshooting related to server, data

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S. No.	Position	Key Staff / Non-Key Staff	International/ Local	Minimum Staff	Project Phase, Fulltime /Intermittent	Educational Qualification & Experience	Role & Responsibility
						Experience: -Total Work Experience; 7 years -Experience in Similar Works as Data Centre Expert/System Administrator; 5 years	base • Expert in data mining and analysis
19	Network Engineer	Non-Key Staff	Local	1	Implementation and O&M Fulltime	Education: - Graduate in Electronics/ Computer Science/or equivalent Engineering Experience: -Total Work Experience; 7 years -Experience in Similar Works as Network Engineer; 5 years	•Primary interface for all network matters and for coordinating with Contractor's developer and technical staff. •Responsible for the design, development, and procurement of all network matter under the proposed contract.
20	Data Base Administrator	Non-Key Staff	Local	1	Implementation and O&M Intermittent	Education: - Graduate in Electronics/Computer Science/or equivalent Engineering Experience: -Total Work Experience; 7 years -Experience in Similar Works as Data Base Administrator; 5 years	• Control room and Data Base management • Gain an in-depth understanding of data structure and data manipulation • Gain an in-depth understanding of data structure and data manipulation • Glean to analyse data using Tableau and become proficient in building interactive dashboards • Data Analytics & Administration

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S. No.	Position	Key Staff / Non-Key Staff	International/ Local	Minimum Staff	Project Phase, Fulltime /Intermittent	Educational Qualification & Experience	Role & Responsibility
21	GIS Expert	Non-Key Staff	Local	1	Implementation and O&M Intermittent	Education: - Graduate in Electronics/ Computer Science / or equivalent Experience: -Total Work Experience; 7 years -Experience in Similar Works as GIS Expert; 5 years	<ul style="list-style-type: none"> • Primary interface for all technical questions and for coordinating with Contractor's developer and technical staff. • Control room and Data centre (Cloud) management • Asset management of all IT Hardware/device and Non-IT items • Prepare accurate GIS 3D Map for city and required resources for ITS
22	Electrical Engineer	Non-Key Staff	Local	1	Implementation and O&M Fulltime	Education: - Graduate in Electrical/or equivalent Experience: -Experience in Similar Works as Electrical Engineer; 5 years - Experience in designing and implementing integrated transportation applications similar to the project requirements. - Experience in relevant projects; 2 projects	<ul style="list-style-type: none"> •Primary interface for all Electric Matters and for coordinating with Contractor's developer • Surveying the electrical availability • Designing the cable routing for scope. • Implementation of duct & cable routing.

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S. No.	Position	Key Staff / Non-Key Staff	International/ Local	Minimum Staff	Project Phase, Fulltime /Intermittent	Educational Qualification & Experience	Role & Responsibility
23	Admin, Human Resource Manager	Non-Key Staff	Local	1	Implementation and O&M Fulltime	Education: - Graduate in HR/ Equivalent Experience: -Total Work Experience; 7 years -Experience in Similar Works as Admin, Human Resource Manager; 5 years	<ul style="list-style-type: none"> • Human Resource Management
24	Communication Expert	Non-Key Staff	Local	1	O&M Intermittent	Education: -Any graduation / Diploma Experience: -Total Work Experience; 7 years -Experience in Similar Domain; 5 years -Social media material development -Public system, Media, Govt. Agency	<ul style="list-style-type: none"> • Publish and control awareness Plan • Publicity of the CITS project and create awareness campaigns for improving public transport, mobility, Traffic, and Commuter's behaviour on city roads. •Spreading awareness to all the stakeholders, through media, press or others
25	ITS Engineer	Non-Key Staff	Local	4	Implementation and O&M Fulltime	Education: - Graduate in Electronics/ or Equivalent Experience: -Total Work Experience; 5 years -Experience in Similar Domain; 3 years	<ul style="list-style-type: none"> •Field support as ITS Engineer

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S. No.	Position	Key Staff / Non-Key Staff	International/ Local	Minimum Staff	Project Phase, Fulltime /Intermittent	Educational Qualification & Experience	Role & Responsibility
26	Field Support Engineer	Non-Key Staff	Local	22	Implementation and O&M Fulltime	Education: -Any graduation / Diploma Experience: -Total Work Experience; 5 years -Experience in Similar Domain; 3 years	•Field support as Maintenance Engineer
27	Field Support Staff - Technician	Non-Key Staff	Local	48	Implementation and O&M Fulltime	Education: -Any graduation / Diploma Experience: -Total Work Experience; 5 years -Experience in Similar Domain; 3 years	•Field support as Maintenance Staff
28	Call Center Operator - TIMS	Non-Key Staff	Local	6	O&M Two (2) person x 3 Shift 24 Hours	Education: - Any graduation / Diploma Experience: - Total Work Experience; 5 years- Experience in Similar Domain; 3 years	•Primary Desktop Operations, Handling calls,

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S. No.	Position	Key Staff / Non-Key Staff	International/ Local	Minimum Staff	Project Phase, Fulltime /Intermittent	Educational Qualification & Experience	Role & Responsibility
29	CBS Operator /Dispatcher -CBS	Non-Key Staff	Local	4	O&M Two (2) Person x 2 Shift	Education: -Any graduation / Diploma Experience: -Total Work Experience; 5 years -Experience in Similar Domain; 3 years	Primary operation related to Bus management
30	TIMS Operator	Non-Key Staff	Local	8	O&M Two (2) Persons x 3 Shift 24 Hours	Education: -Any graduation / Diploma Experience: -Total Work Experience; 5 years -Experience in Similar Domain; 3 years	<ul style="list-style-type: none"> •Review and monitor the traffic congestion through VIDS system •Create and manage incident on the Central ITMS platform •Create and send messages to VMS display •Create and disseminate traffic information through Internet •Monitor and Control of ATCS from Control Centre •Review and approve traffic challan against Violation captured through Red Light Detection System and Speed Violation Detection System

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S. No.	Position	Key Staff / Non-Key Staff	International/ Local	Minimum Staff	Project Phase, Fulltime /Intermittent	Educational Qualification & Experience	Role & Responsibility
31	Helper	Non-Key Staff	Local	4	O&M Fulltime	Education: -Class 10 pass Experience: - Experience in similar work	Help in all the administrative related activities

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Annexure 2-2

5.1 Camera Type 1 -TIDS Camera (Fixed Camera)

Table 5-1: Hardware Requirement of Camera Type 1 -TIDS Camera -Page No.212

S.No.	Item	Requirements
1.	Imaging Device	1/4-inch CCD/CMOS or Better
2.	Video Resolution	2MP or Better
3.	Frame Rate	Min. 60 fps
3.	Scanning area	4.8 mm (H) x 3.6 mm (V) or better
4.	Scanning method	Progressive
5.	Minimum Illuminance	0.3 lx (colour), 0.1 lx (white/black mode) or better
6.	Video S/N ratio	50 dB or more
7.	Compression system	MJPEG/ H.264/ H265/ Or better
8.	Protocol	TCP/IP, UDP/IP, HTTP, RTP, FTP, SMTP, SNMP
9.	LAN terminal	10 BASE-T/100BASE-TX (RJ-45)
10.	Power Requirements	12 V \pm 10% DC / 24 VAC / Hi-PoE Or better
11.	Power Consumption	19 W or less
12.	Reliability and maintainability	MTBF: 30,000 hours / Or Better
13.	Detection Range	Min. 60 meter with IR
14.	Lens	approx. 5 ~ 50 mm or better to achieve functionality
15.	Shutter Speed	approx. 1/4 second to 1/100000 seconds
16.	Camera Housing	Weather-proof: IP-67 or higher Vandal-proof: NEMA 4X-rating or IK10 or higher

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Annexure 2-3

5.2 Camera Type 2- PTZ Camera

Table 5-2: Hardware Requirement of Camera Type 2 -PTZ Camera -Page No.212

S.No.	Item	Requirements
1.	Imaging Device	1/4-inch CCD / CMOS or better
2.	Video Resolution	1920 x 1080 or better
3.	Scanning area	4.8 mm (H) x 3.6 mm (V) or better
4.	Scanning method	Progressive
5.	Minimum Illuminance	0.3 lx (colour), 0.1 lx (white/black mode) or better
6.	Video S/N ratio	50 dB or more
7.	Pan driving range	360-degree endless turning, maximum speed 120 deg./sec more
8.	Tilt driving range	180°, 0.1°- 350°/ better
9.	Compression system	MJPEG, H.264, H265 Or Better
10.	Image size	640x480 (VGA) or higher
11.	Protocol	TCP/IP, UDP/IP, HTTP, RTP, FTP, SMTP, SNMP or better
12.	LAN terminal	10 BASE-T/100BASE-TX (RJ-45)
13.	Power Requirements	12 V ±10% DC / 24 VAC / Hi-PoE or better
14.	Power Consumption	60 W or less
15.	Reliability and maintainability	MTBF: 30,000 hours / Or Better
16.	Zoom Lenz	36 x zoom and autofocus lens
17.	Lens Type	Optical 36 x / digital 16 x or more
18.	Zoom Factor	3.8 to 114 mm /4.25 to 170 mm / Relevant to 36x Zoom
19.	Focal length	Auto
20.	Iris	36 x zoom and autofocus lens Or Better
21.	Detection Range	Min. 500 meter with IR
22.	Lens	approx. 5 ~ 200 mm or better to achieve functionality
23.	Frame Rate	Min. 60 fps or better
24.	Camera Housing	Weather-proof: IP-67 or higher Vandal-proof: NEMA 4X-rating or IK10 or higher

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Annexure 2-4

5.1 VMS Board and Controller

Table 5-1: Hardware Requirement of VMS Board and Controller -Page No.224

No.	Item	Specifications
1.	Board size	8,000 mm (W) x 3,000 mm (H)
2.	Character height	300 mm or more
3.	Display	<ul style="list-style-type: none"> ■ Two (2) or more lines messages shall be required ■ Graphic symbol and Schematic map shall be displayed ■ Three (3) languages as English, Tamil and other shall be required
4.	LED Type	■ Full Colour, class designation C2 as per IRC/EN 12966 standard
5.	Pixel Pitch	10mm or better
6.	Pixel Configuration	1R/1G/1B/SMD
7.	Luminance	L3 + as per IRC/EN 12966 standards.
8.	Luminance Control & auto Diming	<ul style="list-style-type: none"> ■ Should automatically provide different luminance levels but shall also be controllable from the control center using software. ■ Auto dimming capability to adjust to ambient light level (sensor based automatic control) ■ 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.
9.	Luminance Ratio	R2+ as per IRC/EN 12966 standard
10.	Beam width	B3+ as per IRC/EN 12966 standard
11.	Control Method	Synchronized with System
12.	Communication	Wired through RJ45/Wi-Fi/SIM based router or better
13.	Operating Windows for site processor	Operating System as per proposed solution to meet tender requirements
14.	Viewing Angle	B6,B7 as per IRC/EN12966 standard- Viewing angle shall ensure message readability for motorists in all lanes of the approach road
15.	Viewing Distance	Suitable for readability from 150 Mtrs. Or more at the character size of 240mm, from moving vehicles.
16.	Functional features	The VMS boards should have the facility to generate Real Time information of Traffic Data i.e., Traffic Live Congestion, Journey Time, Traffic rerouting, automatically using a site processor embedded system.
17.	Door Alarm	The System should be capable of detecting the unauthorized access of the display door and must send the alert to the central control center.

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No.	Item	Specifications
18.	Health Status	The System should be capable of showing the health status of Processor PCB failure, Temperature monitoring Cluster Failure, Loss of incoming message /data not properly received & etc.
19.	VMS Controller	<p>1) The Software powers up the Media Player at pre- determined times on all functioning days of the Station.</p> <p>2) The Software powers off the unit during the closing hours of the Station.</p> <p>3) Multiple Screen Layouts & independently schedulable Zones.</p> <p>4) Play Standard Multimedia Files: Flash, Videos, Images, etc.</p> <p>5) Time-Sensitive Content – Expired old content to be purged.</p> <p>6) Unattended, Continuous Playback</p> <p>7) Remote Shutdown, Reboot Mode.</p> <p>8) Connect on “as-and-when-needed” basis</p> <p>9) Should be able to use fiber, Wi-Fi, or SIM based router for connectivity. Support closed networks (VPN)</p> <p>10) No need of dedicated bandwidth. Should be operational even if server connectivity is down.</p> <p>11) Play Scheduled Playlist in day parts</p> <p>12) Proof of Play and Log Retrieval</p> <p>13) Support Major Indian Language Fonts</p> <p>14) RAM and FLASH, Frequency as per solution requirement to meet SLA</p> <p>15) It should be able to work unattended for 24x7 operations.</p> <p>16) It should support offline content playback in case of internet/network outage.</p> <p>17) Temperature and humidity sensor shall be inbuilt/interfaced with controller.</p> <p>18) Vertical Clearance for fixed VMS is at least 5.5 meter and above which can bear wind load up to 180 kmph and the concrete pedestal for gantry support column should not exceed more than 1.5m</p>
20.	Others	<p>19) VMS processor should support auto reboot feature in case of system error pop ups automatically.</p> <p>20) VMS processor should be able to showcase dynamic animations based on the weather conditions in real time for weather content slides.</p> <p>21) LED OEM Bin certification for each used LED in VMS board shall submit by Contractor.</p> <p>22) Life of Components of VMS should be more than 7 years</p>

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Annexure 2-5

5.3 ANPR Camera

Table 5-3: Hardware Requirement of ANPR Camera -Page No. 239

S. No.	Item	Requirements
1	Video Compression	H.264/ H.265 or better
2	Video Resolution	8 MP or better
3	Frame rate	Min. 50 FPS or better
4	Image Sensor	1/ 2.8" progressive scan CCD / CMOS or better
5	Lens Type	Varifocal, C/CS Mount, IR Correction full HD lens or better
6	Shutter Speed	1/120 s – 1/10,000s or better
7	Lens	5~50mm or suitable lenses to capture minimum 3.5 meters lane width up to 3 to 4 lanes from a minimum height of 6.5 meters.
8	Illuminator	Integrated external infrared capable to take images in night-time and automatically detect number plate.
9	Day/Night Mode	Removable IR-cut filter for day & night function and anti-glare
10	Region of Interest	4 zones (ON/OFF)
11	S/N Ratio	≥ 50 dB
12	WDR	120 dB or Better
13	Stream	H.264/ H.265 / H.265+, MJPEG or better
14	Streaming Method	Unicast, Multicast
15	Auto adjustment + Remote Control of Image settings	Color, Brightness, sharpness, contrast, white balance, exposure control, backlight compensation, Gain Control, True Wide Dynamic Range
16	Security	Password Protection, IP Address filtering,
17	Camera Interface	Ethernet, Power, any other ports
18	Camera Housing	Weather-proof: IP-66 or higher Vandal-proof: NEMA 4X-rating or IK10 or higher
19	Operating Temp	-5° to 55°C, Humidity 10–85% RH or Better

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Annexure 2-6

6.1 RLVD Camera (Overview Camera)

Table 6-1: Hardware Requirement of RLVD Camera (Overview Camera) -Page No.254

S.No.	Item	Requirements
1.	Imaging Device	1/4-inch CCD/CMOS or Better
2.	Video Resolution	2MP or Better
3.	Frame Rate	Min. 60 fps or better
3.	Scanning area	4.8 mm (H) x 3.6 mm (V)
4.	Scanning method	Progressive
5.	Minimum Illuminance	0.3 lx (colour), 0.1 lx (white/black mode)
6.	Video S/N ratio	50 dB or more
7.	Compression system	MJPEG/ H.264/ H265/ Or better
8.	Protocol	TCP/IP, UDP/IP, HTTP, RTP, FTP, SMTP, SNMP
9.	LAN terminal	10 BASE-T/100BASE-TX (RJ-45)
10.	Power Requirements	12 V \pm 10% DC / 24 VAC / Hi-PoE Or Better
11.	Power Consumption	19 W or less
12.	Reliability and maintainability	MTBF: 30,000 hours / Or better
13.	Detection Range	Min. 60 meter with IR
14.	Lens	approx. 5 ~ 50 mm or better to achieve functionality
15.	Shutter Speed	approx. 1/4 second to 1/100000 seconds
16.	Camera Housing	Weather-proof: IP-67 or higher Vandal-proof: NEMA 4X-rating or IK10 or higher

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Annexure 2-7

6.2 ANPR Camera

Table 6-2: Hardware Requirement of ANPR Camera -Page No.255

S.No.	Item	Requirements
1.	Video Compression	H.264, H.265 or better
2.	Video Resolution	2 MP or better
3.	Frame rate	Min. 60 FPS or better
4.	Image Sensor	1/ 2.8" Progressive Scan CCD / CMOS or Better
5.	Lens Type	Varifocal, C/CS Mount, IR Correction full HD lens or better
6.	IR Cut Filter	Automatically Removable IR-cut filter
7.	Day/Night Mode	Colour, Mono, Auto
8.	Region of Interest	4 zones (ON/OFF)
9.	S/N Ratio	≥ 50 dB
10.	WDR	120 dB or Better
11.	Stream	H.264/ H.265 / H.265+ / MJPEG or better
12.	Streaming Method	Unicast, Multicast
13.	Auto adjustment + Remote Control of Image settings	Colour, Brightness, sharpness, contrast, white balance, exposure control, backlight compensation, Gain Control, True Wide Dynamic Range
14.	Protocol	IPv4, IGMP, ICMP, ARP, TCP, UDP, DHCP, PPPoE, RTP, RTSP, RTCP, DNS, DDNS, NTP, FTP, UPnP, HTTP, HTTPS, SMTP, 802.1x, SNMP, QoS / other
15.	Security	Password Protection, IP Address filtering, User Access Log, HTTPS Encryption
16.	Video Interface	1 port Ethernet / Better
17.	Detection Range	Min. 60 meter with IR
18.	Lens	approx. 5 ~ 50 mm or better to achieve functionality
19.	Shutter Speed	approx. 1/4 second to 1/100000 seconds
20.	Camera Housing	Weather-proof: IP-67 or higher Vandal-proof: NEMA 4X-rating or IK10 or higher

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Annexure 2-8

5.1 Image Recognition Detector and Processing Unit

Table 5-1: Hardware Requirement of Image Recognition Detector and Processing Unit -Page No.270

S.No.	Item	Specifications
1.	Imaging device	1/4-inch CCD/CMOS or Better
2.	Effective pixels	640(H) x 480(V) or more
3.	Resolution	2 MP or better
4.	Image distribution	H.264, H.265 / H.265+, MJPEG or better
5.	Frame rate	60 fps or better
6.	Detected data	■ Traffic volume (Large vehicle/Small vehicle) ■ Vehicle Speed ■ As per define Functionality
7.	Transmitting Period	1 Minutes
8.	LAN Interface	10BASE-T/100BASE-TX (RJ-45) x 1 port
9.	Power Requirements	12 V \pm 10% DC / 24 VAC / Hi-PoE Or Better
10.	Power Consumption	19 W or better
11.	Reliability and maintainability	MTBF: 30,000 hours / Or better
12.	Camera Housing	Weather-proof: IP-67 or higher Vandal-proof: NEMA 4X-rating or IK10 or higher

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Annexure 2-9

8.1 Servers/ 5.1 Servers

Table 8-1: Hardware requirement of Servers- Page No. ER-109

Table 5-1: Hardware requirement of Servers - Page No. ER-286

S.No.	Items	Requirements
1.	General	<ul style="list-style-type: none"> ■ The server should support all industry-leading OS / Hypervisor like Windows, Linux, VMware, KVM, Oracle, etc. or better to meet the tender requirement
2.	Processor	<ul style="list-style-type: none"> ■ Latest generation Intel/AMD 28-Core processor or better ■ Processor speed should be a minimum of 2.6 GHz or better ■ Minimum 2 processors per physical server
3.	RAM	Minimum 512 GB RAM or more
4.	Internal Storage	16 x 1.6 TB SSD or HDD
5.	Network interface	4 x 1GbE or 2 x 10GbE + 2 x 1GbE or 4 x 10GbE or 2 x 25GbE or latest
6.	Power supply	Dual Redundant Power Supply
7.	RAID support	As per requirement/solution
8.	Operating System	Industry-leading OS / Hypervisor like Windows, Linux, VMware, KVM, Oracle, etc. or better to meet the tender requirement
9.	Form Factor	Rack-mountable
10.	Virtualization	Shall support Industry-standard virtualization hypervisors or Better
11.	Storage controller	The server shall have a RAID 5 controller or better as per solution design.
12.	Interfaces	Minimum of 1 Internal USB 3.0 port, 2 VGA ports, the display controller should support VGA, or any other interface required as per final design.
13.	Redundancy	Must have port level, card level redundancy, and redundant hot-plug system fan
14.	Virtualization Support	All Industry-leading OS / Hypervisor or better
15.	Warranty	5 Year OEM Warranty

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Annexure 2-10

8.12 Data Storage / 5.6 Data Storage

Table 8-12: Hardware Requirement of Data Storage- Page No. ER-118

Table 5-6: Hardware Requirement of Data Storage- Page No. ER-289

S.No	Item	Requirements
1.	Solution/ Type	IP Based/iSCSI/FC/NFS/CIFS
2.	Storage	Storage Capacity should be a minimum of 50 TB (usable, after configuring in offered RAID configuration) for online and Near-line data. Or more as per solution /operation/tender requirement
		RAID solution offered must protect against double-disc failure. Or better
		Disks should be preferably minimum of 8 TB capacity or more
		To store all types of data (Data, Voice, Images, Video, etc.)
		Storage system capable of scaling vertically or horizontally or Better or Equivalent
3.	Hardware Platform	Rack-mounted form-factor
		Modular design to support controllers and disk drives expansion or Better or Equivalent
4.	Controllers	At least 2 or more Controllers shall be 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 or better as per solution /operation/tender requirement
5.	RAID support	RAID 5 or 6 or Better
6.	Cache	Minimum 256 GB of useable cache across all controllers or better
7.	Redundancy and High Availability	The Storage System should be able to protect the data against a single point of failure concerning hard disks, connectivity interfaces, fans, and power supplies or any other equipment redundancy required.
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. Or better
		Licenses for the storage management software should include disc capacity/count of the complete solution and any additional disks to be plugged in in the future, up to the max capacity of the existing controller/units.
		A single command console for the entire storage system. Or better
		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
9.	Data Protection	The storage array must have a complete cache protection mechanism either by de-staging data to disk or providing complete cache data protection with battery backup for at least 72 hours or better
10.	Connectivity	Gigabit through required equipment proposed by bidder for to meet functionality or better

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Annexure 2-11

8.15 Network Switch -Level 2/ 5.9 Network Switch -Level 2

Table 8-15 Hardware Requirement of Network Switch -Level 2- Page No. ER-121

Table 5-9: Hardware Requirement of Network Switch -Level 2- Page No. ER-291

(Applicable for Item no A35, A36, A68, A69, K22, K40 in Break Down of Price Schedule No. 2)

S. No.	Item	Requirements
1.	Switching bus	Minimum 1.76 Tbps Switch Fabric Suitable for Higher Density network or better
2.	LAN Interface	48 x 1/10/25-Gbps SFP+ ports and 18 x 40/100-Gbps QSFP28 ports 24-Port 10G SFP+ + 4-Port 100G QSFP28 or Port Required as per actual design
3.	LAN Protocol	TCP/IP, IP Multicast or Better
4.	Layer 2 Faction	<ul style="list-style-type: none"> The Switch shall support IEEE 802.1Q VLAN up to 1000 VLANs. 3.3.2 It shall support for Automatic Negotiation of Trunking Protocol, to help minimize the configuration & errors. Switch shall support centralized VLAN Management. VLANs created on the Core Switches shall be propagated to all the other switches automatically, thus reducing the overhead of creating / modifying / deleting VLANs in all the switches in turn eliminating the configuration errors & troubleshooting. It shall support GVRP / VTP or any other industry standard protocol for VLAN pruning and management. Switch shall support edge port in STP/RSTP/MSTP mode and Ethernet Ring Protection Switching (ERPS) (ITU-T G.8032) or Equivalent. Switch shall support 802.1d, 802.1p, 802.1Q, 802.1s, 802.1w, 802.1x, 802.1ab, 802.3ad. or better Switch shall support spanning-tree root guard to prevent other edge switches becoming the root bridge. Switch shall support IGMP v1, v2 & v3 as well as IGMP v1, v2 & v3 snooping. Switch It shall support Link Aggregation Protocol (LACP). Switch The switch shall support at least 128 Spanning Tree Protocol (STP) instances.
5.	Quality of Service (QoS) Features	<ul style="list-style-type: none"> Switch shall support QoS configuration on per switch port basis
6.	Certificate	UL/IEC/EN 60950 or Equivalent

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Annexure 2-12

8.16 Network Switch -Level 3 /5.10 Network Switch -Level 3

Table 8-16: Hardware Requirement of Network Switch -Level 3- Page No. ER-121

Table 5-10: Hardware Requirement of Network Switch -Level 3- Page No. ER-292

(Applicable for Item no A34, K21 AND K39 in Break Down of Price Schedule No. 2)

S.No.	Item	Requirements
1.	Switching bus	Minimum 1.76 Tbps Switch Fabric Suitable for Higher Density network or better
2.	LAN Interface	48 x 1/10/25-Gbps SFP+ ports and 18 x 40/100-Gbps QSFP28 ports or 24-Port 10G SFP+ + 4-Port 100G QSFP28 or Port Required as per actual design
3.	LAN Protocol	TCP/IP, IP Multicast or Better
4.	Packet Forwarding	Minimum packet forwarding rate of 1309.44 million packets per second or better
5.	Layer 3 Function	<ul style="list-style-type: none"> Switch shall have HSRP/VRRP. Switch shall support IP unicast routing protocols (static, RIPv1, and OSPF). It shall support IP unicast routing for full layer3 routing between 2 or more VLANs. It shall support for BGP/MPLS VPN, Virtual Routing Forwarding (VRF), MPLS/BGP L3 VPN, MP-BGP, BGP v4/v4, IS-IS, IS-ISv6. Switch shall support Policy-Based Routing (PBR). Bidirectional Forwarding Detection (BFD), IP Directed Broadcast. It shall support for IP unicast routing capability (static, RIPv1, RIPv2 and OSPFv3 protocols) to forward IP traffic through configured interfaces support for Protocol Independent Multicast (PIM) for IP Multicast routing, including PIM sparse mode (PIM-SM), PIM dense mode (PIM-DM), and PIM sparse dense mode as well as MPLS support. Switch shall support for Multicast VLAN registration (MVR) to continuously send multicast streams in a multicast VLAN while isolating the streams from subscriber VLANs for bandwidth and security reasons. switch should support IPv6 routing in hardware including RIPng, and RFC2740 for OSPF for IPv6
6.	Quality of Service (QoS) Features	<ul style="list-style-type: none"> Switch shall support QoS configuration on per switch port basis
7.	Certificate	UL/IEC/EN 60950 or better/ equivalent

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Annexure 2-13

5.1 Radar

Table 5-1: Hardware Requirement of SLVD Radar -Page No.238

S.No.	Item	Requirements
1.	Type	3D/4D multi-vehicle tracking radar
2.	Detection	80 or More simultaneous tracking of multiple vehicles in same range and same speed with independent discrimination or Better
3.	Speed Range	Measurement up to 180 km/h or more
4.	Interface	Ethernet/CAN/integrated or Better
5.	Housing	IP67 or better
6.	Drift	Negligible/ no re-calibration/Self Calibration needed over 10-year life.

Annexure 2-14

5.2 Speed Display (Radar Based)

Table 5-2: Hardware requirement of Speed display (Radar based) -Page No.238

S.No.	Item	Requirements
1	Type	Dual Direction 24GHz /77 GHz or Better
2	Speed Range	Measurement up to 180 km/h or more
3	Frequency	24 GHz/ 77 GHz or Better
4	LEDs	Ultra-bright, Tri color Red, Green and Amber -Speed Display
5	Angle	30 Degree cone angle, auto diming
6	Visibility	50 meters
7	Detection range	80 meters
8	Beam Width	12 Degree Horizontal to 25 Degree vertical
9	Housing	IP 65/NEMA 4R/ equivalent
10	Certification	Bin certification from OEM for used LEDs in board, Govt. approval for used radar and BIS
11	Casing	Material: Aluminum
12	Character Size	16 inches up to 3 Character
13	Luminous	Partial Flux: 9000 – 22000 EV, (Lux) Led
14	Temperature	0 to 80 Degree Centigrade

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Annexure 2-15

8.17 SAN Switch /5.11 SAN Switch

Table 8-17: Hardware requirement of SAN switch- Page No. ER-122

Table 5-11: Hardware requirement of SAN switch- Page No. ER-292

S.No.	Item	Requirements
1.	Converge	Fiber switch should be quoted with a minimum of 48 FC ports of 16 Gbps speed or more with all supported licenses from day one or better as per the actual solution design
2.	Protocols	Fibre channel or Ethernet or Better
3.	Controllers	The switch should have autosensing, zoning, integrate Ethernet, and a serial port for communication or better as per the actual solution design
4.	Chassis	The switch should be rack-mountable 1U size and should be supplied with a mounting kit or better as per the actual solution design
5.	Redundancy	The switch should be equipped with a redundant hot-swap power supply and fan with any other redundant equipment required. and allow hot-swap ability with resetting the switch or without affecting the operations of the switch or better per the actual solution design

Annexure 2-16

8.14 Tape Library /5.8 Tape Library

Table 8-14: Hardware requirement of Tape library- Page No. ER-120

Table 5-8: Hardware requirement of Tape library- Page No. ER-291

S.No.	Requirements
1.	<ul style="list-style-type: none"> ■ Shall support Native data capacity of 200TB or More ■ (uncompressed) expandable to 400TB (compressed). or more
2	<ul style="list-style-type: none"> ■ Shall be offered with Minimum of four LTO8 FC tape drive. Drive shall support encryption. Or better as per requirement of solution
3	<ul style="list-style-type: none"> ■ Shall be offered with minimum of 48 Cartridge slots and scalable to minimum 100 Cartridge or More
4	<ul style="list-style-type: none"> ■ Tape Library shall provide 8 Gbps native FC connectivity to SAN switches or Better
5	<ul style="list-style-type: none"> ■ Library shall be able to back up the encrypted keys in a redundant fashion or Better
6	<ul style="list-style-type: none"> ■ Tape Library shall provide web based remote management.
7	<ul style="list-style-type: none"> ■ The library should have cartridge I/O slots for secure & easy off-site backup storage
8	<ul style="list-style-type: none"> ■ Tape Library shall have GUI Panel ■ Shall be rack mountable. ■ Shall have option for redundant power supply
9	<ul style="list-style-type: none"> ■ Should support industry leading backup software
10	<ul style="list-style-type: none"> ■ 40 LTO8 barcode labelled cartridges & 4 cleaning cartridges from the tape library OEM to be provided or Equivalent or Better as per requirement of solution

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Annexure 2-17

5.5 Industrial Grade Layer -2 Switch/ 5.4 Industrial Grade Layer -2 Switch/ 5.6 Industrial Grade Layer -2 Switch/ 6.5 Industrial Grade Layer -2 Switch/ 5.4 Industrial Grade Layer -2 Switch

Table 5 3: Hardware requirement of Industrial grade Layer-2 switch -Page No. ER-186

Table 5-4: Hardware requirement of Industrial grade Layer-2 switch - Page No. ER-214

Table 5-5: Hardware requirement of Industrial grade Layer-2 switch -Page No. ER-240

Table 6-4: Hardware requirement of Industrial grade Layer-2 switch- Page No. ER-256

Table 5-3: Hardware requirement of Industrial grade Layer-2 switch-Page No. ER -271

S.No.	Item	Requirements
1	Ethernet Interfaces	4 x 10/100/1000 Base-T PoE+ Ports auto-negotiation Plus 4 x 1000 Base-X SFP or 2 x 10G SFP+ Uplink Slots (Should be loaded with 2 x 1G Single mode Industrial Grade Fibre Modules supports up to 10 Km) Or Better
2	Performance	Switching fabric 16 Gbps or more
		Forwarding rate 11.8 Mpps or more
3	PoE Budget	120 Watts
4	VLANs	512
5	Level 2 switching	IEEE 802.1, 802.3 standards, NTP/SNTP, UDLD, LLDP, Unicast MAC filter, LACP, Voice VLAN, , STP, RSTP, MSTP, GARP/GMRP/ GVRP or equivalent ,SNMPv1/v2c/v3, SNMP Inform, DHCP Server/Relay/Client, RARP/ARP, TFTP, RMON, HTTP, HTTPS, Syslog, MRP or VRRP, LLDP, 802.1x, NetFlow/sFlow, port mirroring, Digital Diagnostic Monitoring (DDM) or Uplink interface monitoring
6	Quality of Service (QoS)	Rate limit, auto QoS, ingress policing, egress queuing, and shaping
7	Multicast	IGMPv1, v2, v3 snooping, IGMP filtering, IGMP querier, MLD snooping v1, v2
8	Management	ICMP, Telnet, SSH, ARP, Syslog, SNMPv1/v2, RMON, SMTP/SNTP, HTTP, HTTPS IPv4, IPv6
9	Security	Port security, 802.1x, Dynamic VLAN assignment, Dynamic Host Configuration Protocol (DHCP) snooping, dynamic ARP inspection, IP Source Guard, storm control - unicast, multicast, broadcast, SSH, SNMPv3, TACACS+
10	Power Input Voltage	• 12 to 56 VDC with Redundant dual power inputs with 5- PIN/2x2 Lockable Terminal Block
		• Reverse Polarity / Surge Protection
11	Warranty	Min 5 years
12	Power Supply	Bidder should provide Industrial Grade AC/DC DIN RAIL power supply.

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Annexure 2-18

8.2 Workstation (3 monitors)

Table 8-2: Hardware Requirement of Workstation (3 monitors) -Page No.ER-111

S.No.	Item	Requirements
1.	General	<ul style="list-style-type: none"> Operator Console shall enable operators to use applications of each TIMS component Workstation manufactured by internationally reputed organization (OEM) 5 years hardware supporting warranty with Next Business Day Onsite Service Readily available in India Space saving type enclosure Low energy consumption
2.	Processor	<ul style="list-style-type: none"> Latest 11th Generation Intel® Xeon® W-1350P (12 MB Cache, 6 Core, 4.0 GHz to 5.1 GHz (125W) or Better
3.	OS	<ul style="list-style-type: none"> Latest Windows/Other operating system or compatible OS with the server OS.
4.	Memory	<ul style="list-style-type: none"> 64GB ECC 4x16GB DDR4 2933MHz RDIMM nonECC Memory or Better
5.	Storage	<ul style="list-style-type: none"> Intel Integrated controller (RST-e) with 1-2 Front FlexBay NVMe PCIe Drives M.2 256GB PCIe NVMe, Solid State Drive 1TB 7200rpm SATA 2.5" HDD or better
6.	Graphic card	<ul style="list-style-type: none"> NVIDIA GEFORCE RTX 3070, 8GB, 4DP /AMD Radeon Pro W5500, 8GB, 4 DP/or Better
7.	Display ports	<ul style="list-style-type: none"> 3 Displays Ports, or higere 1 HDMI / compatible display ports/As per requiremnt
8.	GPU	<ul style="list-style-type: none"> Base clock: 1290 MHz or better Number of cores: 768 or better VRAM: 4GB or better Display connectors: DP 1.4, HDMI 2.0b, dual link-DVI multimonitor support Max resolution: 7680 x 4320 @ 60 Hz or better
9.	Console Display Monitor	<ul style="list-style-type: none"> 3 monitors Three monitors that are 21-inch integrated or more size of LCD or Better widescreen monitor (Full HD or UHD – 60 Hz refresh rate) Aspect Ratio – 16:9 or Better Resolution 2560x1440 Better Brightness 300cd/m2 Better RGB Analogue, DVI-D or HMDI required as input interface, 1 HDMI Display Port Picture-by-Picture view 2 different input sources on one screen that should be same as of video interface. Or IP based Monitors
10.	Peripheral	<ul style="list-style-type: none"> 8x DVD+/-RW or better
11.	Keyboard	<ul style="list-style-type: none"> Wired keyboard with 104 keys or wireless
12.	Mouse	<ul style="list-style-type: none"> Wired Optical with USB interface or wireless
13.	Ports	<ul style="list-style-type: none"> USB Ports including 2 USB 3.0 Ports and audio ports for microphone and headphone
14.	Cabinet	<ul style="list-style-type: none"> Mini Tower
15.	Network	<ul style="list-style-type: none"> 1000/100M Base LAN interface Wireless 802.11 a/b/g/n/ac or better
16.	Security	<ul style="list-style-type: none"> Virus protection/ The hardware vendor should supply an AI Based performance optimizer software, which ensures optimum performance tuning for leading CAD/CAE

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S.No.	Item	Requirements
17.	Reliability	<ul style="list-style-type: none"> ■ MTBF > 3 years x 365 days x 24 hours = 26,280 hours ■ MTTR < 24 hours ■ Monitoring temperature of CPU & inside casing, HD status. ■ Alerting function when faults. ■ Latest SNMP supporting
18.	Power Consumption	<ul style="list-style-type: none"> ■ AC230V, 950W or better

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Annexure 2-19

8.3 Workstation (1 monitor)

Table 8-3: Hardware Requirement of Workstation (1 monitor) -Page No.ER-112

S.No.	Item	Requirements
1.	General	<ul style="list-style-type: none"> ■ Operator Console shall enable operators to technical support team, Call center team etc. ■ Workstation manufactured by internationally reputed organization ■ 5 years hardware supporting warranty ■ Readily available in India ■ Space saving type enclosure ■ Low energy consumption
2.	Processor	■ Intel Xeon processor (4core) 3.0GHz, cache 8MB or better
3.	OS	■ Latest Windows/Another operating system or compatible OS with the server OS.
4.	Memory	■ 16GB, DDR4 UDIMM non-ECC Memory or better
5.	Storage	■ 512 GB SSD or better as per requirement
6.	Graphic card	■ NVIDIA GEFORCE RTX 3070, 8GB, 4DP /AMD Radeon Pro W5500, 8GB, 4 DP/or Better
7.	Console Display Monitor	<ul style="list-style-type: none"> ■ Professional or Flat Model ■ 21-inch or more size of LCD type or better ■ widescreen monitor (Full HD or UHD – 60 Hz refresh rate) ■ Aspect Ratio – 16:9 or better ■ Resolution 2560x1440 or better ■ Brightness 300cd/m2 or better ■ RGB Analogue, DVI-D or HMDI required as input interface, 1 HDMI Display Port ■ Picture-by-Picture view 2 different input sources on one screen that should be same as of video interface. Or IP based Monitors
8.	Display ports	■ 1 VGA, 2 Displays Ports, 1 HDMI
9.	GPU	<ul style="list-style-type: none"> ■ Base clock: 1290 Mhz or better ■ Number of cores: 768 or better ■ VRAM: 4GB or better ■ Display connectors: DP 1.4, HDMI 2.0b, dual link-DVI multimonitor support ■ Max resolution: 7680 x 4320 @ 60 Hz or better
10.	Peripheral	■ 8x DVD+/-RW or better
11.	Keyboard	■ Wired keyboard with 104 keys or wireless or better
12.	Mouse	■ Wired Optical with USB interface or wireless or better
13.	Ports	■ USB Ports including 2 USB 3.0 Ports and audio ports for microphone and headphone
14.	Cabinet	■ Mini Tower or better
15.	Network	■ 1000/100M Base LAN interface or better
16.	Security	■ Virus protection, The hardware vendor should supply an AI Based performance optimizer software, which ensures optimum performance tuning for leading CAD/CAE
17.	Reliability	<ul style="list-style-type: none"> ■ MTBF > 3 years x 365 days x 24 hours = 26,280 hours ■ MTTR < 24 hours ■ Monitoring temperature of CPU & inside casing, HD status. ■ Alerting function when faults., Latest SNMP supporting

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S.No.	Item	Requirements
18.	Power Consumption	■ AC230V, 300 W or better

Annexure 2-20

8.19 Firewall/5.13 Firewall

Table 8-19: Hardware Requirement of Firewall with IPS-Page No.ER-123

Table 5-13: Hardware Requirement of Firewall with IPS-Page No.ER-294

S. No	Parameter	Minimum Requirement Specification
1	Architecture	Solution should propose built and provide Next Generation Firewall capabilities.
2		Should be based on multi core processors and not on proprietary hardware platforms
3		Proposed Firewall should not be proprietary hardware in nature & should be open architecture based on multi-core cpu's to protect & scale against dynamic latest security threats.
4		Proposed solution should support High-Availability as part of the proposal
5		Operating Environment - 0°C ~ 35°C
6	Performance	The complete solution should support minimum of 6 Gbps of NGFW throughput
7		The complete solution should support minimum of 3.5 Gbps of Threat Prevention throughput
8		The complete solution should support should be able to scale upto 15 Gbps of Threat Prevention Throughput in Future if required by adding additional Hardware
9		Minimum of 8 Million concurrent sessions & should scaleup in future by field upgrade
10	Hardware & Interface	Minimum 4 numbers of 1G Ethernet ports , 4 x 10G Fibre SFP+ ports
11		Minimum 32 GB of Memory
12		Should support both Console and USB ports
13	Certifications	The Firewall OEM should be Common Criteria EAL 4 certified
14	Security	Solution should be able to support Firewall, IPS, Application Control, URL Filtering, AV, BOT Prevention in a single box deployment
15		Solution should support for IPSEC VPN
16		The IPS should have minimum 10000+ CVE. Application control database must contain more than 3500+ known applications. Should have a URL categorization that exceeds 100+ million URLs

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17		Anti-Bot application must use a multi-tiered detection engine, which includes the reputation of IPS, URLs and DNS addresses and detect patterns of bot communications. Look for C&C traffic patterns, not just at their DNS destination.
18		The solution should have detection and prevention capabilities for DNS tunnelling attacks
19		Solution must support access control for at least 150 predefined services/protocols
20		Solution must support Configuration of dual stack gateway on a bond interface, OR on a sub-interface of a bond interface
21		IPS must provide at least minimum two pre-defined profiles/policies that can be used immediately
22		IPS must have a mechanism to convert SNORT signatures
23		Must have a dedicated client agent that can be installed by policy on users' computers that can acquire and report identities to the Security Gateway
24		Must support Kerberos transparent authentication for single sign on
25		Solution must be able to create a filtering for single site being supported by multiple categories.
26		Solution should have up-to-date threat intelligence
27		The solution should support Zero Day Protection solution
28	Routing	Policy based routing
29		Should support both Static and Dynamic routing protocols
30	Deployment Architecture & Management Function	Management should be a dedicated management appliance or a VM running on Open Server
31		Console and Browser based configuration
32		Solution should be able to support Inline deployment
33		Solution must be able to segment the rule base in a sub-policy structure in which only relevant traffic is being forwarded to relevant policy segment for an autonomous system
34		Management should include Logging & Reporting as part of it or a dedicated Appliance or VM for Logging & Reporting.
35	Support & Services	All solutions hardware/software provided should not be having EOS/EOL announced.
36		The solution should support comprehensive Network DLP as part of the solution.

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Annexure 2-21

4. System Functional Requirement (CBS)

Table : Functional requirement of System server architecture- Page No.ER-278

S. No.	Requirements
General	
Server Virtualization for Primary and Secondary Servers	
1.	<ul style="list-style-type: none"> Virtualization software should be a bare-metal hypervisor with the functionality of High Availability, Complete Availability, hot Add (CPU, Memory, Storage & Network), dynamic resource scheduler, Centralized distributed switch proven features. Virtualization software shall provide a Virtualization layer that sits directly on the bare metal server hardware with no dependence on a general-purpose OS Ability to present more memory to virtual machines than physically available by dynamically (re)allocating memory to virtual machines when needed/reclaiming it when not needed to maximize consolidation ratios Virtualization software should provide integration of 3rd party endpoint security to secure the virtual machines with offloaded antivirus, anti-malware solutions without the need for agents inside the virtual machines. The Solution should have tight integration and management framework that virtualizes SAN/NAS arrays. Provide granular VM-Centric controls, automated self-rebalancing capabilities to align with defined Storage service levels Provide Interactive topology maps to visualize the relationships between physical servers, virtual machines, networks, and storage. The solution should offer automated orchestration of site failover and failback with a single click to reduce recovery times. The solution should offer Centralized management of recovery plans from the virtualization manager console replacing the manual run books both DC and DR The solution should offer frequent, non-disruptive testing of recovery plans to ensure highly predictable recovery objectives. The solution shall provide prebuilt & customizable operations dashboards & reports to provide real-time insight into infrastructure behavior, upcoming problems, and opportunities for efficiency improvements The solution should provide capacity analytics to do "What If" scenarios such as Project planning to identify the resource shortfall and do Capacity Planning for Future workload requirements. The solution should offer a planned migration workflow to enable disaster avoidance and data center mobility. The solution should provide a log analytical tool that will collect data from various data Sources The solution shall provide the ability to identify and report on over-sized, under-sized, idle, and powered-off virtual machines such that the environment can be right-sized, and resources can be reclaimed
Cloud Server for Backup Servers	
2.	<ul style="list-style-type: none"> If the Contractor chooses the cloud as the backup server then the eligible cloud service providers (CSPs) shall be the Ministry of Electronics & Information Technology (MeiTY) empaneled CSPs as per the Guidelines for Procurement of Cloud Services (MeiTY). End-to-end firewall, email and web security, intrusion protection, and event and log management around the clock, 365 days a year. Managed host-based intrusion detection system to prevent malware from infecting your virtual servers. Emergency response services when a cloud breach is suspected.

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8.23 Web Application Firewall (WAF) Appliance with DDOS Protection

5.24 Web Application Firewall (WAF) Appliance with DDOS Protection

(Applicable for A37 and K23 in Break Down of Price Schedule No. 2)

Table : Requirement of Web Application Firewall (WAF) Appliance with DDOS Protection Page No.ER-125

Table : Requirement of Web Application Firewall (WAF) Appliance with DDOS Protection Page No.ER-301

S. No.	Web Application Firewall Parameter
1	Proposed appliance should be deployed in HA (High Availability) mode and protect the web applications from attacks.
2	Proposed solution shall prevent the following attacks but not limited to: Brute force, Access to predictable resource locations, Unauthorized navigation, HTTP request format and limitation violations (size, unknown method, etc.) and File upload violations
3	Solution should be able to inspect web application output and respond (allow, block, mask and/or alert) based on the active policy or rules, and log actions taken.
4	Support dynamic source IP blocking and should be able to block attacks based on IP source.
5	BOT detection and prevention should be available out of the box and should not need additional licenses; BOT performance latency and false positive metrics should be available for ease of use.
6	API protection including OAuth support, API Key management, and webhook parsing
7	Support automatic updates (if required) to the signature database, ensuring complete protection against the latest application threats.
8	The proposed solution should integrate with Source code analysis solution that can identify vulnerabilities in technologies like Java, PHP, C# VB.Net, Python, C/C++. The proposed solution should provide report-based integration with the mentioned source code analysis solution to gain information on the vulnerability entry point, control flow and data flow of the vulnerable function.
9	Proposed solution should have the ability to detect attacks using multiple sources: For example, detect attacks within
	• Raw traffic,
	• Mirrored traffic,
	• PCAP files,
10	• Web server log files
	Analysis of following application protocols:
	• HTTP and HTTPS,
	• XML and XML-based protocols (SOAP and other)
	• JSON
11	• AMF
	• GWT
11	Protection from data leaks by detecting and masking sensitive data in application responses.
	DDoS Parameter
12	The proposed solution should be in high availability mode

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13	Appliance should have minimum 4x1G RJ45 and 2 X 1G SFP WAN Interfaces and 4X1G RJ45 and 2 X 1G SFP LAN interfaces. Should have Dual redundant Internal Power supply
14	The Anti DDoS module is expected to constantly monitor the behaviour of the application visitors and prevent common application layer attacks.
15	The proposed solution should detect and mitigate both traditional network- layer DDoS attacks and more advanced application layer attacks.
16	The proposed solution should prevent suspicious outbound traffic for threats and blocking malicious traffic.
17	The proposed solution must support the ability to blacklist a host, domain, URL
18	should support dynamic proximity and static proximity rules to direct the traffic to closest data centre.
19	should support floating MAC address to avoid MAC table updates on the upstream routers/switches and to speed up the failover
20	should support for secondary communication link for backup purpose
21	Should support floating IP address and group for state full failover support. Appliance must have support 256 floating ip address for a floating group
22	should support built in failover decision/health check conditions including, CPU overheated, system memory, process health check, unit failover, group failover and reboot
23	should also have option to define customized rules for gateway health check - the administrator should able to define a rule to inspect the status of the link between the unit and a gateway
24	The appliance should have extensive reporting and logging with inbuilt tcp dump
25	The appliance should have SSH CLI, Direct Console, SNMP, Single Console per Cluster with inbuilt reporting.
26	Should support 3rd party management and monitoring of the devices.
27	The appliance should provide detailed logs and graphs for real time and time-based statistics

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Annexure 2-23

5.17 EPABX

Table 5-17: Hardware requirement of EPABX -Page No.ER-296

No	Item	Requirements
1.	Technology	SIP/ PCM-TDM/ IP/ Non-blocking or other
2.	Type of Interface	ISDN interface for digital, basic interface for Analog lines
3.	No. of lines - ,ISDN PRI lines & Analog / Digital Extensions	2 PRI, 32 Extensions (IP / Analog / Digital) or more
4.	Type of Extension Support	Analog, Digital/ IP
5.	Run Distance	Not less than 800 meters. on 0.5mm dia. Cable
6.	Contact centre Expansion available (Max. capacity)	It must support at least 32 Call centre Agents
7.	Other	<ul style="list-style-type: none">• ISDN supplementary services for Digital phone• Support for digital trunk lines• Working on 230v AC mains and DC voltage• Support for ACD call centre with CTI and advanced call routing
8.	Design of EPABX System	Rack mountable
9.	Conferencing	To be configurable as required

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Annexure 2-24

Chapter 4 Bill of Quantity (BOQ)

1. Supply of Plant/Equipment and Spare parts -Page No.ER-344

Item No.	Description	Unit	Qty
(1)	(2)	(3)	(4)
201	Chennai Traffic Information & Management System Command Control Centre (TIMS-CCC)	-	-
i	Control Centre Room	-	-
A1	Call Centre Application and Database	No	1
A2	IP PABX System with IVR	No	1
A3	Operator Client Licenses	Lot	1
ii	Meeting Room	-	-
A4	70" LED display	Nos	2
A5	Over Head Projector	No	1
iii	Furniture	-	-
A6	TIMS Operation Room Operator Desks	Lot	1
A7	TIMS Management Room Manager's Desks	Lot	1
A8	TIMS Management Room Meeting Table (14-Seater or More)	Lot	1
A9	Call Centre Operator Desks	Lot	1
A10	Security Room Desks	Lot	1
A11	Help Desk Team Desks	Lot	1
A12	Technical Support Team Desks	Lot	1
A13	Meeting Room Furniture (10-Seater or More)	Lot	1
A14	High Back Executive Chair	Lot	1
iv	Building Utilities	-	-
A15	Interior works including fall ceiling, utility duct, Accessories as per requirement (Power Switch Boards, PVC Conduits, Power and Network cables, etc) (Approx. 7500 Sq. Ft)	Lot	1
A16	Access Control System	Nos	4
A17	Fire & Smoke Detection System	Lot	1
A18	Lighting	Lot	1
A19	DG Set for TIMS Control Centre with 72 hours backup	No	1
A20	Air-condition for TIMS Control Centre	Lot	1
A21	UPS Parallel Redundant with Battery backup of 3 hours	Lot	1
A22	CCTV surveillance at TIMS Control Centre	Nos	4
A23	PA system for building	Lot	1
A24	Wi-Fi accessible across control centre	Lot	1
A25	Provision for Sanitization	Lot	1
v	Hardware Components	-	-
	Hardware Components for Data Centre	-	-
A26	Network Racks	Lot	1

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Item No.	Description	Unit	Qty
(1)	(2)	(3)	(4)
A27	Server Racks	Lot	1
A28	Servers- (As per System Design)	Lot	1
A29	Internet Server	Lot	1
A30	Load Balancer	Lot	1
A31	Firewall with IPS	Lot	1
A32	Data Storage	Lot	1
A33	SAN Switch	Lot	1
A34	Network Switch -Level 3	Lot	1
A35	Network Switch -Level 2 (24 Port)	Lot	1
A36	Network Switch -Level 2 (48 Port)	Lot	1
A37	Web Application Firewall (WAF) Appliance with DDOS Protection	Lot	1
A38	Tape Drive	Nos	1
A39	Cartridge Magazine	Lot	1
	Hardware components for Control Centre	-	-
A40	Video Wall Panel, with Controller, 70"	Nos	48
A41	Video Wall Switcher	No	1
A42	Multi-Function Laser Printer – Colour A3, A4 (TIMC Management Room)	Nos	2
A43	Operator Workstations -3 Monitor (Main Control Room)	Nos	15
A44	Manager Workstation	No	3
A45	Help Desk Team Workstations (Main Control Room)	Nos	2
A46	Technical Support Team Workstations	Nos	6
A47	Call Centre Workstations	Nos	4
A48	Security Room Workstations	Nos	1
A49	Meeting/Situation Room Workstation	No	1
A50	IP Phones	Nos	37
A51	Call Recording Device	No	1
	Software Components at Data Center	-	-
A52	Video wall management Software	Lot	1
A53	Virtualization Software	Lot	1
A54	Centralized Antivirus Software	Lot	1
A55	Access Control System Software	Lot	1
A56	Backup software	Lot	1
A57	CAL, OS, database license, Other Software for Data center	Lot	1
vi	Network Bandwidth	-	-
	TIMS Network Backbone	-	-
A58	Redundant Bandwidth Cost (For Edge Equipment)	Lot	1
A59	Primary Internet Bandwidth (For TIMS to CBS Data Center)	Lot	1
A60	Primary Internet Bandwidth (For TIMS to DR)	Lot	1
A61	Secondary Internet Bandwidth (For TIMS to CBS Data Center)	Lot	1
A62	Secondary Internet Bandwidth (For TIMS to DR)	Lot	1

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Item No.	Description	Unit	Qty
(1)	(2)	(3)	(4)
vii	ITMS		
A63	ITMS (Application Software)	Lot	1
A64	EMS Application	No	1
A65	Website	No	1
A66	Mobile Application (Android & iOS)	No	1
viii	Mandatory Spare Parts		
A67	L3 Switch (Copper /OFC)	Nos	1
A68	LEVEL 2 Switch (24 Port)	Nos	1
A69	LEVEL 2 Switch (48 Port)	Nos	1
A70	SAN-SW	Nos	1
A71	IP Phones	Nos	2
A72	Call Recording Device	Nos	1
ix	Other Items	-	-
A73	Other items required to meet the RFP requirements of TIMS-CCC	Lot	1
202	Adaptive Traffic Signal Control System (ATCS)	-	-
i	Controller with accessories	-	-
B1	Signal Controller	Nos	165
B2	Controller Cabinet	Nos	165
ii	Detector	-	-
B3	Vehicle Detector	Nos	570
iii	Mounting	-	-
B4	Standard Poles	Nos	716
B5	Cantilever Poles	Nos	567
iv	Aspects & Activation Buttons	-	-
B6	Vehicular Aspect - Red Ball	Nos	1158
B7	Vehicular Aspect - Amber Ball	Nos	1158
B8	Vehicular Aspect - Green Ball / Straight	Nos	953
B9	Vehicular Aspect - Green Arrow Left	Nos	814
B10	Vehicular Aspect - Green Arrow Right	Nos	839
B11	Vehicular Aspect - Red Arrow Right	Nos	260
B12	Vehicular Aspect - Amber Arrow Right	Nos	260
B13	Pedestrian Aspects – Walk	Nos	1154
B14	Pedestrian Aspects - Flashing Don't Walk with Timer	Nos	1154
B15	Pedestrian - Push Button	Nos	1154
B16	Pedestrian Buzzer	Nos	1154
B17	Green U- turn aspect	Nos	57
V	Software	-	-
B18	ATCS Application	Lot	1
vi	Connectivity	-	-

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Item No.	Description	Unit	Qty
(1)	(2)	(3)	(4)
B19	Network Equipment with accessories	Nos	165
vii	Power Requirements	-	-
B20	Outdoor UPS with batteries for 3-hour backup for field elements	Nos	165
viii	Mandatory Spare Parts	-	-
B21	Standard Poles	Nos	46
B22	Cantilever Poles	Nos	34
B23	Signal Controller	Nos	10
B24	Controller Cabinet	Nos	10
B25	Vehicle Detector	Nos	34
B26	Vehicular Aspect - Red Ball	Nos	70
B27	Vehicular Aspect - Amber Ball	Nos	70
B28	Vehicular Aspect - Green Ball / Straight	Nos	58
B29	Vehicular Aspect - Green Arrow Left	Nos	50
B30	Vehicular Aspect - Green Arrow Right	Nos	50
B31	Vehicular Aspect - Red Arrow Right	Nos	16
B32	Vehicular Aspect - Amber Arrow Right	Nos	16
B33	Pedestrian Aspects – Walk	Nos	70
B34	Pedestrian Aspects - Flashing Don't Walk with Timer	Nos	70
B35	Pedestrian - Push Button	Nos	70
B36	Pedestrian Buzzer	Nos	70
B37	Green U - turn aspect	Nos	5
B38	Network Equipment with accessories	Nos	3
B39	Outdoor UPS with batteries for 3-hour backup for field elements	Nos	8
ix	Other items	-	-
B40	Other items required to meet the RFP requirements of ATCS	Lot	1
203	Traffic Incident Detection System (TIDS)	-	-
i	Equipment	-	-
C1	TIDS (Application Software)	Lot	1
C2	TID Camera	Nos	60
C3	PTZ Camera	Nos	58
C4	Controller	Nos	58
C5	Network Equipment with accessories	Nos	58
C6	UPS for 3-hour backup with Batteries and Outdoor junction Box	Nos	58
ii	Material	-	-
C7	Cabinet	Nos	58
C8	Pole Type-A	Nos	39
C9	Pole Type-B	Nos	8
C10	Pole Type-C	Nos	11
iii	Mandatory Spare Parts	-	-

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Item No.	Description	Unit	Qty
(1)	(2)	(3)	(4)
C11	Cabinet	Nos	3
C12	Pole Type-A	Nos	2
C13	Pole Type-B	Nos	1
C14	Pole Type-C	Nos	1
C15	TID Camera	Nos	4
C16	PTZ Camera	Nos	3
C17	TIDS Cameras Controller	Nos	3
C18	Network Equipment with accessories	Nos	3
C19	UPS for 3-hour backup with Batteries and Outdoor junction Box	Nos	3
Iv	Other items	-	-
C20	Other items required to meet the RFP requirements of TIDS	Lot	1
204	Variable Message Sign System (VMS)	-	-
i	Equipment	-	-
D1	VMS System (Application Software)	Lot	1
D2	VMS Board with controller and necessary accessories	Nos	17
D3	Network Equipment with accessories	Nos	17
D4	UPS for 3- hours backup with Batteries and Outdoor junction Box	Nos	17
ii	Material	-	-
D5	Cabinet	Nos	17
D6	Gantry	Nos	17
iii	Mandatory Spare Parts	-	-
D7	VMS Board with controller and necessary accessories	No	1
D8	Network Equipment with accessories	No	1
D9	UPS for 3- hours backup with Batteries and Outdoor junction Box	No	1
iv	Other items	-	-
D10	Other items required to meet the RFP requirements of VMS	Lot	1
205	Speed Limit Violation Detection System (SLVD)	-	-
i	Equipment	-	-
E1	SLVD (Application Software)	Lot	1
E2	Doppler Radar and ANPR Camera	Nos	11
E3	IR Illuminator/Flash for SLVD	Nos	11
E4	Local Software for SLVD	Nos	11
E5	LPU for SLVD	Nos	11
E6	Speed Display Board (Radar based)	Nos	11
E7	Network Equipment with accessories	Nos	11
E8	UPS for 3-hours backup with Batteries and Outdoor junction Box	Nos	11
ii	Material	-	-
E9	Cabinet	Nos	11

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Item No.	Description	Unit	Qty
(1)	(2)	(3)	(4)
E10	Standard Pole	Nos	11
iii	Mandatory Spare parts	-	-
E11	Cabinet	Nos	1
E12	Standard Pole	Nos	1
E13	Doppler Radar and ANPR	Nos	2
E14	IR Illuminator for SLVD	Nos.	2
E15	LPU for SLVD	No	1
E16	Speed display (Radar based)	No	1
E17	Network Equipment with accessories	No	1
E18	UPS for 3 -hours backup with Batteries and Outdoor junction Box	No	1
iv	Other items	-	-
E19	Other items required to meet the RFP requirements of SLVD	lot	1
F	Red Light Violation Detection System (RLVD)	-	-
i	Equipment	-	-
F1	RLVD System (Application Software)	Lot	1
F2	ANPR Camera (One per lane)	Nos	439
F3	IR Illuminator for ANPR	Nos	439
F4	RLVD Camera	Nos	165
F5	Local Software for ANPR	Nos	439
F6	Local Software for RLVD	Nos	165
F7	LPU for RLVD & ANPR	Nos	165
F8	Network Equipment with accessories	Nos	50
F9	UPS for 3h backup with Batteries and Outdoor junction Box	Nos	50
ii	Material	-	-
F10	Cabinet	Nos	50
F11	Gantry (U-Type)	Nos	135
F12	Cantilever Pole (L-Type)	Nos	30
iii	Mandatory Spare Parts	-	-
F13	Cabinet	Nos	3
F14	Gantry (U-Type)	Nos	1
F15	Cantilever Pole (L-Type)	Nos	2
F16	ANPR Camera (One per lane)	Nos	23
F17	IR Illuminator for ANPR	Nos	23
F18	RLVD Camera	Nos	12
F19	LPU for RLVD & ANPR	Nos	12
F20	Network Equipment with accessories	Nos	3
F21	UPS for 3- hours backup with Batteries and Outdoor junction Box	Nos	3
iv	Other items	-	-
F22	Other items required to meet the RFP requirements of RLVD	Lot	1

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Item No.	Description	Unit	Qty
(1)	(2)	(3)	(4)
G	Automatic Traffic Cum- Counter (ATCC)	-	-
i	Equipment	-	-
G1	ATCC1 System (Application Software)	Lot	1
G2	ATCC2 System (Application Software)	Lot	1
G3	Image Recognition Detector	Nos	230
G4	Processing Unit	Nos	230
G5	Network Equipment with accessories	Nos	230
G6	UPS for 3- hours backup with Batteries and Outdoor junction Box	Nos	230
ii	Material	-	-
G7	Cantilever Pole with Dual Arm	Nos	54
G8	Cantilever Pole with Single Arm	Nos	117
G9	Cabinet	Nos	171
iii	Mandatory Spare Parts	-	-
G10	Cantilever Pole with Dual Arm	Nos	3
G11	Cantilever Pole with Single Arm	Nos	6
G12	Cabinet	Nos	6
G13	Image Recognition Detector	Nos	12
G14	Processing Unit	Nos	12
G15	Network Equipment	Nos	12
G16	UPS for 3h backup with Batteries and Outdoor junction Box	Nos	12
iv	Other items	-	-
G17	Other items required to meet the RFP requirements of ATCC	Lot	1
208	Computer Aided Dispatch/ Automatic Vehicle Location System (CAD/AVL)	-	-
i	CAD/AVL Software		
H1	CAD/AVL Central Application	Lot	1
H2	EMS Application	Lot	1
ii	CAD/AVL Hardware	-	-
H3	Onboard ITS Device (SCU & BDC)	Nos	2940
H4	SIM Cards	Nos	3500
H5	Cable and necessary components to connect panic button, VHMD device, In-bus route boards with SCU	Nos	3500
H6	Workstation at Depot - with 21" dual monitor	Nos	31
H7	UPS for 3 hours backup with Batteries	Nos	31
iii	CAD/AVL Mandatory Spare Parts	-	-
H8	Onboard ITS Device (SCU&BDC)	Nos	147
H9	Workstation at Depot - with 21" dual monitor	Nos	2
H10	UPS for 3 hours backup with Batteries	Nos	2

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Item No.	Description	Unit	Qty
(1)	(2)	(3)	(4)
iv	Integration items		
H11	Integration of panic button in 3500 buses (560 new & 2940 existing buses)	Nos	3500
H12	Integration of Vehicle Health and Monitoring Device in 560 new buses	Nos	560
H13	Integration of in-bus route boards in 560 new buses	Nos	560
H14	Integration of Vehicle Health and Monitoring Device in 2940 existing buses	Nos	2940
H15	Integration of in-bus route boards in 2940 existing buses	Nos	2940
H16	Integration with existing 110 variable message boards	Nos	1
iv	Other items	-	-
H17	Other items required to meet the RFP requirements of CAD/AVL	Lot	1
209	Passenger Information System (PIS)		
i	PIS Software	-	-
I1	PIS Software with ETA/ETD calculation	No	1
I2	Commuter Website	No	1
I3	Commuter SMS System	No	1
I4	Commuter Mobile Application (Android & iOS)	No	1
ii	PIS Hardware	-	-
I5	Type A - PIS - LED boards at Terminals	Nos	20
I6	Type B - PIS - LED 4 Line boards	Nos	96
I7	Type C - PIS - LED 2 Line boards	Nos	500
I8	Pole	Nos	20
I9	SIM Cards	Nos	616
I10	UPS for 3 hours backup with Batteries and Outdoor junction Box	Nos	20
I11	UPS for 1 hour backup for 4-line and 2-line boards with Batteries and Outdoor junction Box	No	596
iii	PIS Mandatory Spare Parts	-	-
I12	Type A - PIS - LED boards at Terminals	No	1
I13	UPS for 3 hours backup with Batteries and Outdoor junction Box	Nos	1
I14	Type B - PIS - LED 4 Line boards	Nos	5
I15	Type C - PIS - LED 2 Line boards	Nos	20
I16	UPS for 1 hour backup for 4-line and 2-line boards with Batteries and Outdoor junction Box	Nos	25
iv	Other items	-	-
I17	Other items required to meet the RFP requirements of PIS	Lot	1
210	Depot Management System (DMS)		
i	DMS Software	-	-
J1	Vehicle Planning and Scheduling	No	1
J2	Vehicle Dispatch and Crew Rostering	No	1
J3	Attendance Management System	No	1
J4	MTC Staff Mobile Application (Android & iOS)	No	1
ii	DMS Hardware	-	-

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Item No.	Description	Unit	Qty
(1)	(2)	(3)	(4)
J5	Workstation at Depot - with 21" single monitor	Nos	31
J6	Printer Laser – A4	Nos	31
J7	Biometric Reader	Nos	62
J8	UPS with 3 hours backup for DMS Workstation & Printer	Nos	31
iii	Mandatory Spare Parts	-	-
J9	Biometric Reader	Nos	4
J10	Workstation at Depot - with 21" single monitor	Nos	2
J11	UPS with 3 hours backup for DMS Workstation & Printer	Nos	2
iv	Other items	-	-
J12	Other items required to meet the RFP requirements of DMS	Lot	1
211	CBS Command Control Centre	-	-
i	Control Centre Room	-	-
K1	IP PABX/EPABX System including 2 - PRI lines	No	1
K2	Land Line Phone (IP phone Video Phones)	Nos	14
ii	Meeting Room	-	-
K3	70" LED display	No	1
iii	Furniture	-	-
K4	Control centre Table and Chair as per the proposed layout	Lot	1
iv	Building Utilities	-	-
K5	Fire & Smoke Detection System	Lot	1
K6	Lighting	Lot	1
K7	DG Set CBS (ITS equipment Load Only) 72 hours backup	No	1
K8	100% parallel redundant UPS with 3 hours backup	Lot	1
K9	CCTV surveillance at CBS Control Centre	Nos	4
K10	Wi-Fi accessible at control Center	Lot	1
K11	Provision for Sanitization	Lot	1
K12	Interior works including fall ceiling, utility duct, Accessories as per requirement (Power Switch Boards, PVC Conduits, Power and Network cables, etc) (Approx. 2500 Sq. Ft)	Lot	1
v	Hardware Components	-	-
K13	Network Racks	Lot	1
K14	Server Racks	Lot	1
K15	Servers (AVL, PIS & DMS)	Lot	1
K16	Internet Server	Lot	1
K17	Load Balancer	Lot	1
K18	Firewall with IPS	Lot	1
K19	Data Storage	Lot	1
K20	SAN Switch	Lot	1
K21	Network Switch -Level 3	Lot	1
K22	Network Switch -Level 2	Lot	1

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Item No.	Description	Unit	Qty
(1)	(2)	(3)	(4)
K23	Web Application Firewall (WAF) Appliance + DDOS Protection	Lot	1
K24	Tape Drive	No	1
K25	Cartridge Magazine	Lot	1
vi	Hardware components for Control Centre	-	-
K26	Video Wall Panel, with Controller, 70" (3x3)	No	1
K27	Video Wall Switcher	No	1
K28	Network LaserJet Printer - A3 & A4 paper	No	1
K29	All in One Printer (Color Print, Copy, FAX)	No	1
K30	Workstation for CAD/AVL & PIS with 21" dual Monitor	Nos	22
K31	Technical Support Team Laptop	Nos	4
vii	Software Components at Data Centre	-	-
K32	Video wall management Software	Lot	1
K33	Virtualization Software	Lot	1
K34	Centralized Antivirus Software	Lot	1
K35	Backup software	Lot	1
K36	CAL, OS, database license as per design, other software	Lot	1
viii	Network Bandwidth	-	-
	CBS Network Backbone	-	-
K37	Primary Connectivity (Mpls or Leased line)	Lot	1
K38	Secondary Connectivity (Mpls or Leased line)	Lot	1
ix	Mandatory Spare Parts		
K39	L3 Switch (Copper + OFC)	Nos	1
K40	LEVEL 2 Switch (48 Port)	Nos	1
K41	SAN-SW	Nos	1
K42	Land Line Phone	Nos	1
K43	Hands free/Headphone for dispatchers	Nos	1
x	Other Items	-	-
K44	Other items required to meet the RFP requirements of CBS-CCC	Lot	1

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Annexure 2-25

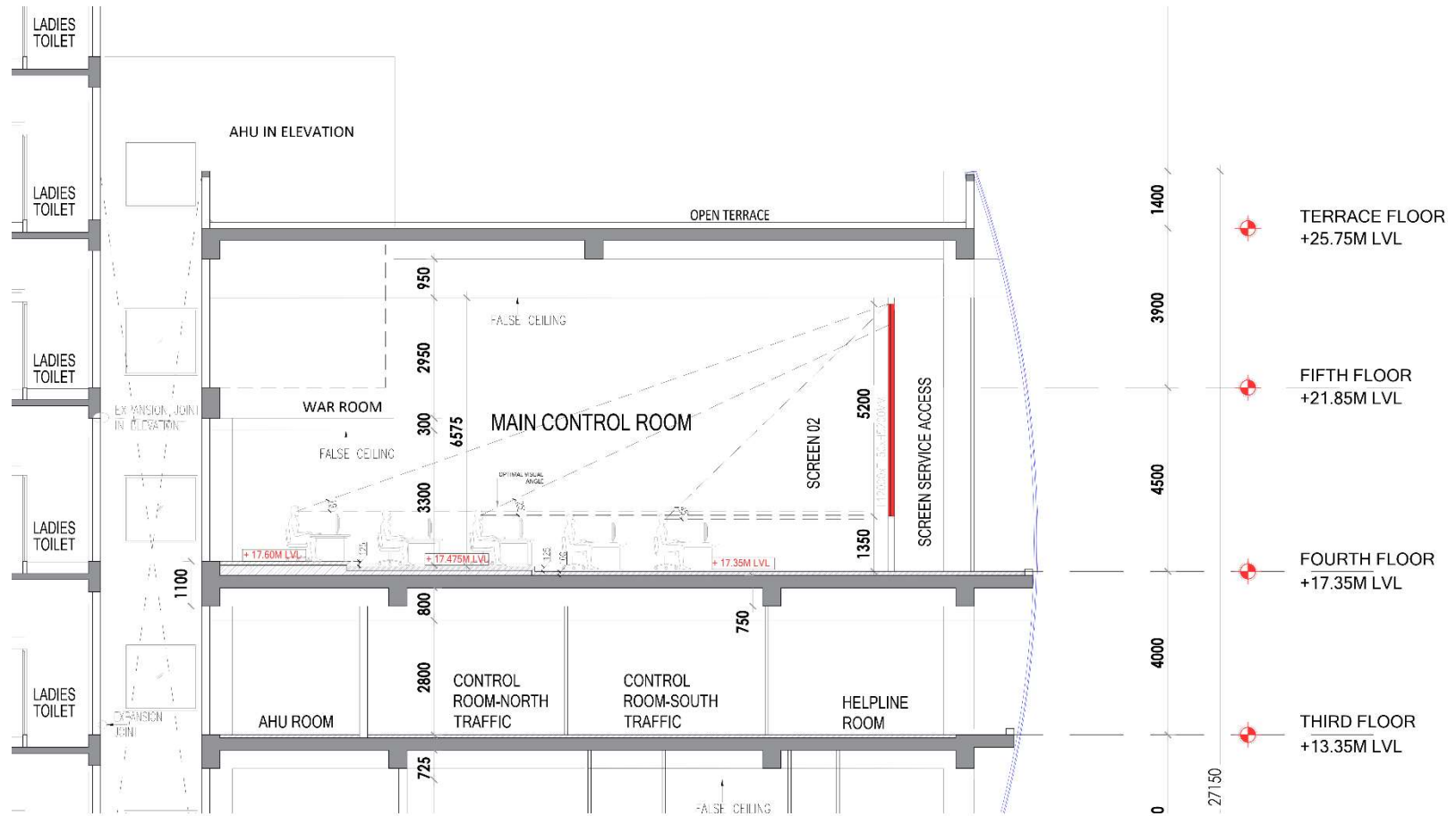
TIMS-CCC Layout

Reference Drawing



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Systems in Chennai**
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TIMS-CCC Layout

Reference Drawing

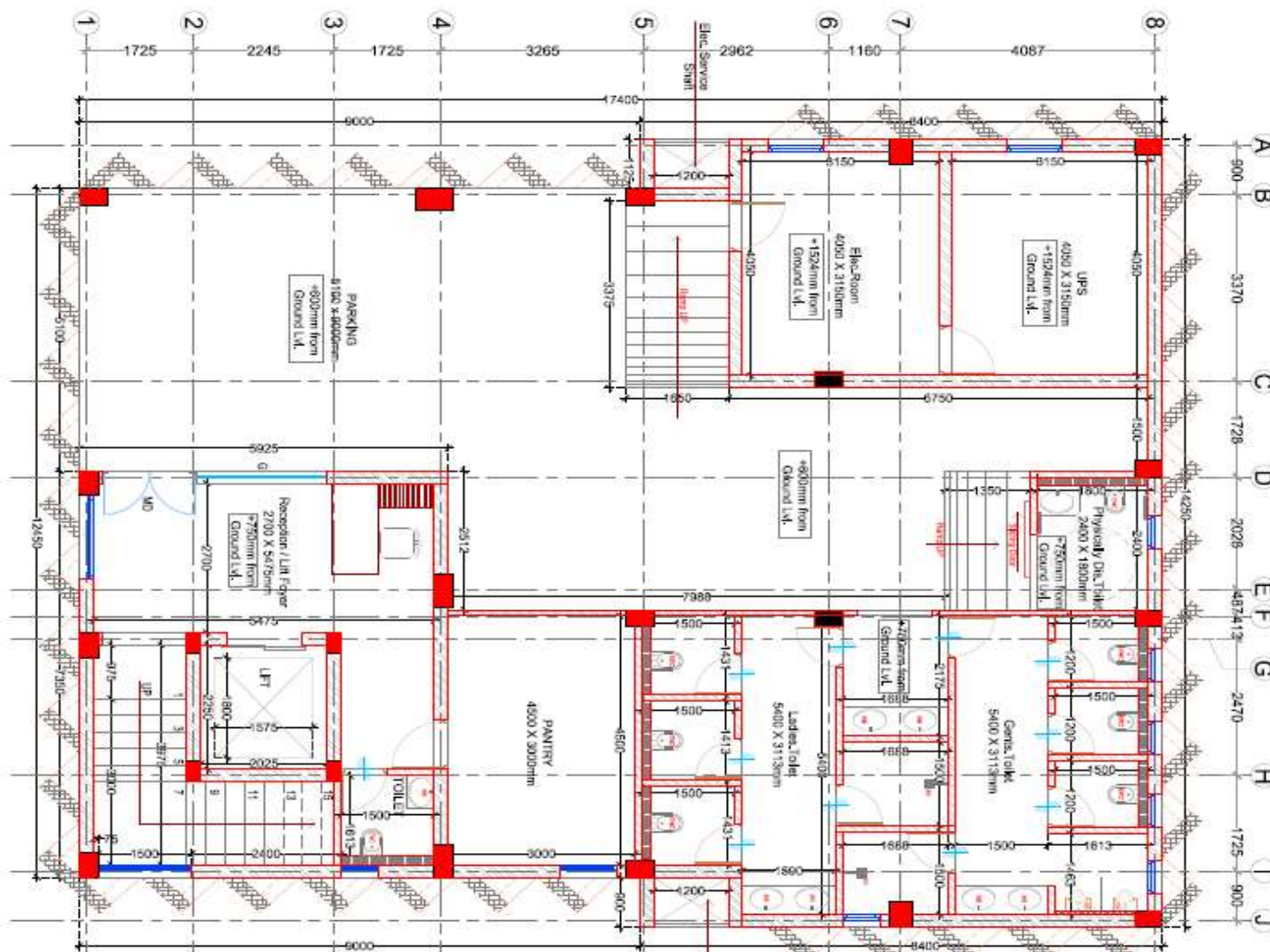


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CBS - CCC Layout (Ground Floor)

Reference Drawing



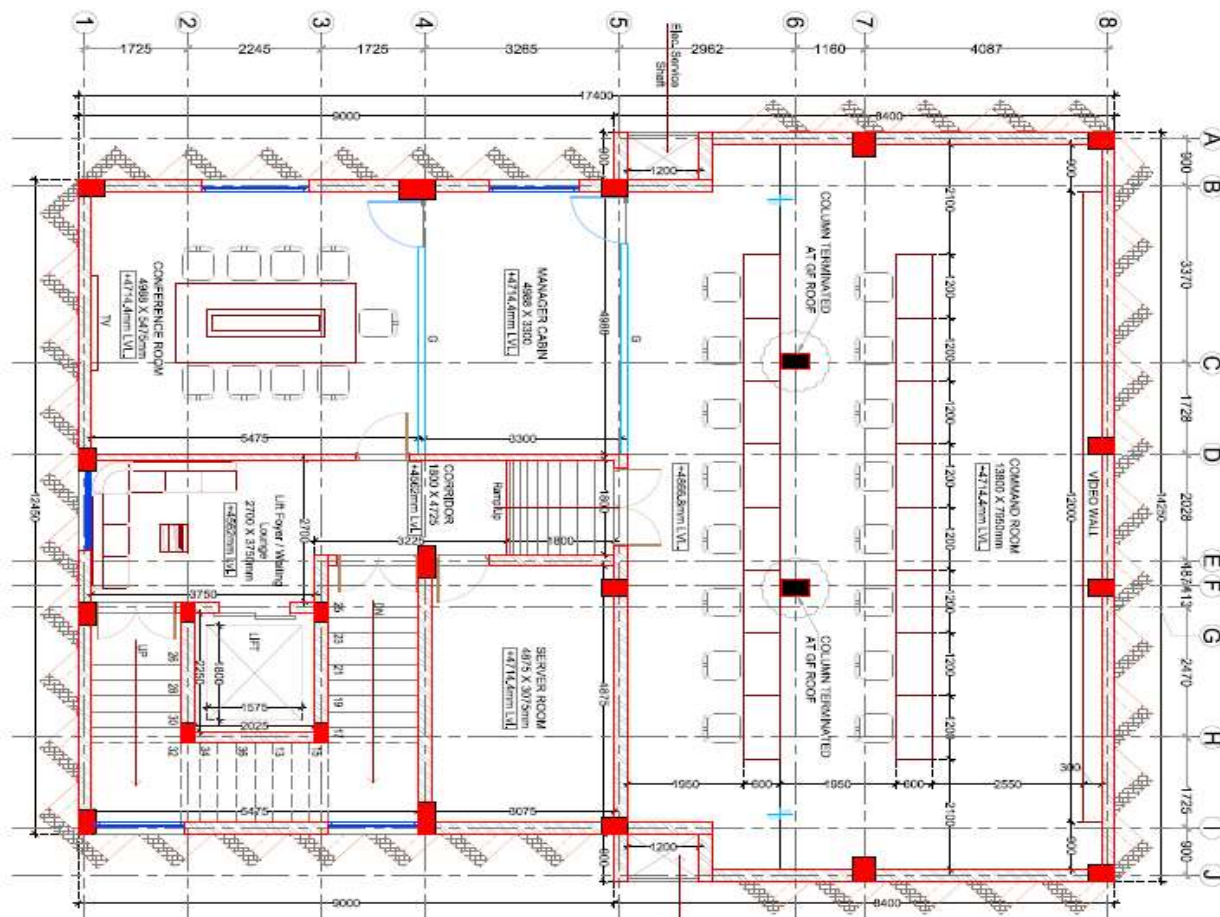
OCCUPANCY	NOS	CARPET AREA
UPS	01	12,75 Sq.mt
Elec.ROOM	01	12,75 Sq.mt
PANTRY	01	13,49 Sq.mt
RECEPTION	01	14,78 Sq.mt
TOILET(Gents & Ladies)	01	42,49 Sq.mt
STAIRCASE & LIFT BLOCK	01	22,99 Sq.mt
PARKING	01	45,9 Sq.mt
Phy. Disabled,TOILET	01	4,32 Sq.mt
CORRIDOR BETWEEN TOILET AREA & Elec.ROOM	01	35,70 Sq.mt
TOTAL	08	205,17 Sq.mt

TOTAL BUILD UP AREA - 231.75 SQ.MT

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CBS - CCC Layout (First Floor)

Reference Drawing



OCCUPANCY	NOS	CARPET AREA
COMMAND ROOM (WS-16 Nos)	01	107.14 Sq.mt
CONFERENCE ROOM (9P)	01	27.30 Sq.mt
SERVER ROOM	01	14.99 Sq.mt
WAITING LOUNGE	01	10.125 Sq.ft
MANAGER CABIN	01	16.45 Sq.mt
STAIRCASE & LIFT BLOCK	01	23.70 Sq.mt
CORRIDOR	01	9.044 Sq.mt
TOTAL	07	208.74 Sq.mt

TOTAL BUILD UP AREA = 231.75 SQ.MT

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Annexure 2-26

5.22 Indoor Fixed Dome Camera at Command Control Centre

Table 5-23: Hardware requirement of Indoor fixed dome camera at CCC - Page No.299

No	Item	Requirements
1.	Video Compression	H.264 / H.265 or better
2.	Video Resolution	1080p or better
3.	Frame rate	Min. 25 fps or better
4.	Image Sensor	1/3" Progressive Scan CCD / CMOS
5.	Lens Type	Varifocal, IR Correction Full HD lens compatible to camera imager
6.	Lens#	Auto IRIS 2.8-10mm or better
7.	Multiple Streams	Dual streaming with 2 nd stream at minimum 720P at 30fps at H.264 individually configurable
8.	Minimum Illumination	Colour: 0.1 lux, B/W: 0.01 lux (at 30 IRE)
9.	IR Cut Filter	Automatically Removable IR-cut filter
10.	Day/Night Mode	Colour, Mono, Auto
11.	S/N Ratio	≥ 50 dB
12.	Auto adjustment + Remote Control of Image settings	Colour, brightness, sharpness, contrast, white balance, exposure control, backlight compensation, Gain Control, Auto back focus
13.	Wide Dynamic Range	True WDR 80 dB or better
14.	Audio	Full duplex, line in and line out, G.711, G.726
15.	Local storage	microSDXC card 128GB (Class 10) or better 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	HTTP, HTTPS, FTP, RTSP, RTP, TCP, UDP, RTCP, DHCP, ONVIF Profile S &G
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 3 rd part interface
20.	Operating conditions	0°C to 50°C
21.	Casing	NEMA 4X / IP-66 rated & IK 09
22.	Power	802.3af PoE (Class 0)/12VDC/24AC

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Annexure 2-27

Interactive Voice Response (IVR)- Page No.155

Interactive Voice Response (IVR)	
No	Requirements
1.	IVR System shall support Tamil and English languages.
2.	IVR System shall be integrated with TIMS database to get the live update of the traffic to provide real time information to the public/commuter.
3.	IVR system shall allow handling minimum of 20 calls at a time.
4.	The system shall able to record all the incoming call number, duration of the call, total calls per day and it shall be available to generate as report when required.
5.	Bidder to provide the report with the detail of how many calls are received from public/commuter, duration of each call, average call hours per day.
6.	At minimum, IVR system shall provide following information: <ul style="list-style-type: none">• Real-time traffic information• Planned road closure• Provide response to citizen during incident/accident• Providing flood related information• Disaster information• Unusual events• Any other events identified during design stage, etc.

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Annexure 3-1

SCH 2: Schedule of Payment

In accordance with the provisions of GC Clause 14 (Contract Price and Payment), the Employer shall pay the Contractor in the following manner and at the following times, on the basis of the Schedules of Rates and Prices given in the section on Price Schedules. Payments will be made in the currencies quoted by the Bidder. Applications for payment in respect of part deliveries may be made by the Contractor as work proceeds.

TERMS OF PAYMENT

Schedule No. 1 Design Services for Section 1, Section 2 and Section 3

In respect of design services for both the foreign currency and the local currency portions, the following payments shall be made:

Ten percent (10%) of the total design services amount as an advance payment within twenty-one (21) days after receipt of invoice, and an irrevocable advance payment security for the equivalent amount made out in favour of the Employer.

Ninety percent (90%) of the total or pro rata design services amount upon approval of design in accordance with GC Clause 5 by the Engineer within forty-five (45) days after receipt of invoice.

Schedule No. 2 Plant and Equipment Supplied from Abroad for Section 1, Section 2 and Section 3

In respect of plant and equipment supplied from abroad, the following payments shall be made:

Ten percent (10%) of the total CIP amount as an advance payment within twenty-one (21) days after receipt of invoice and an irrevocable advance payment security for the equivalent amount made out in favour of the Employer. The advance payment security may be reduced in proportion to the value of the plant and equipment delivered to the site, as evidenced by shipping and delivery documents.

Forty percent (40%) of the total or pro rata CIP amount upon Incoterm "CIP", upon receipt at Contractor's warehouses at Project site (destination) within forty-five (45) days after receipt of invoice and documents.

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The contract of carriage shall include the cost of unloading the goods at destination, as well as payment by the Contractor of the cost of custom formalities, duties, taxes or other charges payable on the foreign Goods for their transit through any country other than the Purchaser's country.

The following documents are acceptable as the documents required for payment:

- a) Contractor's detailed invoice showing commodity description, quantity, unit price, total price and basis of delivery, reference to items as per Bill of Quantities, Schedule of Prices
- b) Clean on-board ocean vessel bill of lading or charter party bill of lading
- c) Packing List
- d) Policy or certificate of insurance,
- e) Manufacturer's Guarantee,
- f) Inspection Certificate,

Twenty percent (20%) of the total or pro rata CIP amount upon achieving the passing of the pre-commissioning tests, within forty-five (45) days after receipt of invoice.

Twenty percent (20%) of the total or pro rata CIP amount upon achieving the passing of the commissioning tests, within forty-five (45) days after receipt of invoice.

Ten percent (10%) of the total or pro rata CIP amount upon issue of the Taking-Over Certificate, within forty-five (45) days after receipt of invoice.

Schedule No. 3 Plant and Equipment Supplied from within the Employer's Country for Section 1, Section 2 and Section 3

In respect of plant and equipment supplied from within the Employer's country, the following payments shall be made:

Ten percent (10%) of the total EXW amount as an advance payment within twenty-one (21) days after receipt of invoice, and an irrevocable advance payment security for the equivalent amount made out in favour of the Employer. The advance payment security may be reduced in proportion to the value of the plant and equipment delivered to the site, as evidenced by shipping and delivery documents.

Forty percent (40%) of the total or pro rata EXW amount upon Incoterm "Ex-Works," upon receipt at Contractor's warehouse at Project site (destination) within forty-five (45) days after receipt of invoice and documents.

The following documents are acceptable as the documents required for payment,

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- a) Contractor's detailed invoice showing commodity description, quantity, unit price, total price and basis of delivery, reference to items as per Bill of Quantities, Schedule of Prices, and
- b) Proof of dispatch
- c) Packing List
- d) Policy or certificate of insurance,
- e) Manufacturer's Guarantee,
- f) Inspection Certificate,

Twenty percent (20%) of the total or pro rata EXW amount upon achieving the passing of the pre-commissioning tests, within forty-five (45) days after receipt of invoice.

Twenty percent (20%) of the total or pro rata EXW amount upon achieving the passing of the commissioning tests, within forty-five (45) days after receipt of invoice.

Ten percent (10%) of the total or pro rata EXW amount upon issue of the Taking-Over Certificate, within forty-five (45) days after receipt of invoice.

Schedule No. 4 Installation Services for Section 1, Section 2 and Section 3

In respect of installation services for both the foreign and local currency portions, the following payments shall be made:

Ten percent (10%) of the total installation services amount as an advance payment within twenty-one (21) days after receipt of invoice, and an irrevocable advance payment security for the equivalent amount made out in favour of the Employer. The advance payment security may be reduced in proportion to the value of work performed by the Contractor as evidenced by the invoices for installation services.

Sixty percent (60%) of the total or pro rata value of installation services performed by the Contractor upon achieving the passing of the pre-commissioning test, within forty-five (45) days after receipt of invoice.

Twenty percent (20%) of the total or pro rata value of installation services performed by the Contractor upon achieving the passing of the commissioning test, within forty-five (45) days after receipt of invoice.

Ten percent (10%) of the total or pro rata value of installation services performed by the Contractor as evidenced by the Employer's authorization of the Contractor's monthly applications, upon issue of the Taking-Over Certificate, within forty-five (45) days after receipt of invoice.

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Schedule No. 5 Comprehensive Operation and Maintenance Services for Section 4 and Section 5

In respect of Comprehensive Operation and Maintenance Service for both the foreign and local currency portions, the following payments shall be made:

The amount certified in each Interim Payment Certificate within 56 days after the Engineer receives the Statement and supporting documents submitted by the Contractor made in quarterly basis in accordance with GC Sub-Clause 14.3.

When the SLA (Service Level Agreement) does not reach the target, the Employer can deduct calculated amount from quarterly billing value as penalty. Penalties shall be applied for each criterion individually and then added together for the total penalty for a particular quarter according to Employers Requirement.

Schedule No. 6 Operation and Maintenance Manpower for Section 4 and Section 5

In respect of Operation and Maintenance Manpower for both the foreign and local currency portions, the following payments shall be made:

The amount certified in each Interim Payment Certificate within 56 days after the Engineer receives the Statement and supporting documents submitted by the Contractor made in quarterly basis in accordance with GC Sub-Clause 14.3.

When the manpower assignment and Spare parts inventory does not comply with the requirement and contract, the Employer can deduct calculated amount from quarterly billing value as penalty according to Employers Requirement.