



**Request For Proposal (RFP) for Design, Supply,
Installation, Testing, Commissioning and
Operation & Maintenance of Advanced Traffic
Management System (ATMS) projects in Zone-1
(Delhi Region) on EPC mode**



RFP No.: IHMCL/ATMS/Zone-Delhi Region/2026/01
20 May 2026

Issued By:
Indian Highways Management Company Ltd. (IHMCL)

NOTICE INVITING RFP

RFP No.: IHMCL/ATMS/Zone-Delhi Region/2026/01

20 May 2026

- I. Indian Highways Management Company Limited (Hereinafter referred to as “Authority” or “IHMCL”) intends to engage the Request For Proposal (RFP) for Design, Supply, Installation, Testing, Commissioning and Operation & Maintenance of Advanced Traffic Management System (ATMS) projects in Zone-1 (Delhi Region) on EPC mode
- II. The Project shall be complete turnkey solution with provision of skilled resources at all locations for operation and maintenance. The period of engagement shall be 12 months of project implementation and trial run period and 60 Months of O&M period.
- III. The prospective Bidders are hereby invited to submit their bids comprising Technical and Financial bids through e-tendering mode only by the bid due date. Bid shall be valid for 120 days w.e.f. bid due date. The bids should be submitted online only on e-tender portal of Government of India and in the prescribed formats. No change in the formats and / or other mode of bid submission is permissible.
- IV. Bidder should pay Tender Application Fee (non-refundable) **Rs. 25,000/- (Rupees Twenty-Five Thousand Only)** inclusive of GST through online mode. The Bidder shall also upload the online payment receipt.
- V. The Indian Highways Management Company Limited now invites bids from eligible System Integrators (ATMS – Contractors) for the following project:

Name of Work	Tender Application Fee	EMD	Construction Period	Operation & Maintenance Period
Request For Proposal (RFP) for Design, Supply, Installation, Testing, Commissioning and Operation & Maintenance of Advanced Traffic Management System (ATMS) projects in Zone-1 (Delhi Region) on EPC mode	Rs. 25,000/- (Rupees Twenty Five Thousand only)	Rs. 4.80 Cr	12 Months	60 Months of O&M Period after Construction (Design, Supply, Installation, Testing & Commissioning) Period.

- VI. The complete BID document can be viewed / downloaded from official portal of IHMCL <http://www.ihmcl.co.in> or e-procurement portal of IHMCL <https://etenders.gov.in> from 20.05.2026 to 06.07.2026. Bidder must submit online its financial bid and Technical Bid at <https://etenders.gov.in> on or before 06.07.2026 up to 17:00 Hrs. IST. Bids received online shall be opened on 07.07.2026 at 17:30 Hrs. IST.
- VII. Bid through any other mode shall not be entertained. Please note that the Authority reserves the right to accept or reject all or any of the BIDs without assigning any reason whatsoever.

Officer In-charge

COO - IHMCL,
Indian Highways Management Company Limited
G-5&6, Sector-10, Dwarka, New Delhi- 110075
Phone – 011- 25074100 Extn - 1804
e-mail: tenders@ihmcl.com

Disclaimer

The information contained in this RFP document (the "RFP document") or subsequently provided to Bidder(s), whether verbally or in documentary or any other form by or on behalf of IHMCL or any of its employees or advisors, is provided to Bidder(s) on the terms and conditions set out in this RFP document and such other terms and conditions subject to which such information is provided.

This RFP document is not an agreement and is neither an offer nor invitation by IHMCL to the prospective Bidders or any other person. The purpose of this RFP document is to provide interested parties with information that may be useful to them in making their technical/ financial offers ("Bid(s)") pursuant to this RFP document. This RFP document includes statements, which reflect various assumptions and assessments arrived at by IHMCL in relation to the Project. Such assumptions, assessments, and statements do not purport to contain all the information that each Bidder may require. This RFP document may not be appropriate for all persons, and it is not possible for IHMCL, its employees or advisors to consider the investment objectives, financial situation, and particular needs of each party who reads or uses this RFP document. The assumptions, assessments, statements and information contained in this RFP document, may not be complete, accurate, adequate or correct. Each Bidder should, therefore, conduct its own investigations and analysis and should check the accuracy, adequacy, correctness, reliability, and completeness of the assumptions, assessments, statements, and information contained in this RFP document and obtain independent advice from appropriate sources.

Information provided in this RFP document to the Bidder(s) is on a wide range of matters, some of which may depend upon interpretation of law. The information given is not intended to be an exhaustive account of statutory requirements and should not be regarded as a complete or authoritative statement of law. IHMCL accepts no responsibility for the accuracy or otherwise for any interpretation or opinion on law expressed herein.

IHMCL, its employees and advisors make no representation or warranty and shall have no liability to any person, including any applicant or Bidder under any law, statute, rules or regulations or tort, principles of restitution or unjust enrichment or otherwise for any loss, damages, cost or expense which may arise from or be incurred or suffered on account of anything contained in this RFP document or otherwise, including the accuracy, adequacy, correctness, completeness or reliability of the RFP document and any assessment, assumption, statement or information contained therein or deemed to form part of this RFP document or arising in any way for participation in this Bid.

IHMCL also accepts no liability of any nature whether resulting from negligence or otherwise howsoever caused arising from reliance of any Bidder upon the statements contained in this RFP document. IHMCL may in its absolute discretion, but without being under any obligation to do so, update, amend, or supplement the information, assessment or assumptions contained in this RFP document.

The issue of this RFP document does not imply that IHMCL is bound to select a Bidder or to appoint the Successful Bidder for the Project and IHMCL reserves the right to reject all or any of the Bidders or Bids without assigning any reason whatsoever.

The Bidder shall bear all their costs associated with or relating to the preparation and submission of their Bid including but not limited to preparation, copying, postage, delivery fees, expenses associated with any demonstrations or presentations which may be required by IHMCL or any other costs incurred in connection with or relating to Bid. All such costs and expenses will remain with the Bidder and IHMCL shall not be liable in any manner whatsoever for the same or for any other costs or other expenses incurred by a Bidder in preparation or submission of the Bid, regardless of the conduct or outcome of the Bidding Process.

Document Composition

This RFP Documents comprise for following parts:

Part-I	Instructions to Bidders
Part-II	Formats for Bid Submission
Part-III	Draft Format of Contract Agreement

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PART-I INSTRUCTIONS TO BIDDERS

1. INTRODUCTION

1.1. Background

- 1.1.1. Indian Highways Management Company Limited (Hereinafter referred to as “**Authority**” or “**IHMCL**”) intends to engage the System Integrator for Design, Supply, Installation, Testing, Commissioning and Operation & Maintenance of Advanced Traffic Management System (ATMS) projects in Zone 1 – Delhi Region on EPC mode.
- 1.1.2. The Project shall include implementation of a comprehensive ATMS and its Operation and maintenance on Zone 1 – Delhi Region on EPC mode. The construction period of the Project is 12 months and O&M Period of 60 Months.

Brief particulars of the Project are as follows:

RFP Ref. No	Name of Work	Construction Period	Operation & Maintenance period
RFP No.: IHMCL/ATMS/ Zone-Delhi Region/2026/ 01	Request For Proposal (RFP) for Design, Supply, Installation, Testing, Commissioning and Operation & Maintenance of Advanced Traffic Management System (ATMS) projects in Zone-1 (Delhi Region) on EPC mode	12 months	60 Months (After successful completion/commissioning of the ATMS-System)

- 1.1.3. The Selected Bidder (the “ATMS Contractor”) shall be responsible for Design, Supply, Installation, Testing, Commissioning and Operation & Maintenance of Advanced Traffic Management System (ATMS) projects in Zone 1 – Delhi Region on EPC mode in accordance with the provisions of an engineering, procurement and construction contract (the “EPC Contract”) to be entered into between the ATMS Contractor and the Authority in the form provided by the Authority as part of the Bidding Documents pursuant hereto. The scope of work will broadly include Design, Supply, Installation, Testing, Commissioning and Operation & Maintenance of Advanced Traffic Management System (ATMS) projects in Zone 1 – Delhi Region on EPC mode and duration of Operations & Maintenance of the ATMS Project, which shall be 5 (Five) years (After 12 months of implementation period).
- 1.1.4. Deleted
- 1.1.5. The Agreement sets forth the detailed terms and conditions for award of the project to the ATMS Contractor, including the scope of the ATMS Contractor’s services and obligations.
- 1.1.6. The Authority shall receive BIDs pursuant to this RFP in accordance with the terms set forth in this RFP, and all BIDs shall be prepared and submitted in accordance with such terms on or before the BID due date specified in Clause 2 for submission of BIDs (the “BID Due Date”).
- 1.1.7. The Bidder shall use the official portal of IHMCL <http://www.ihmcl.co.in> or e-procurement portal of GOI <https://etenders.gov.in> to download and upload the documents.
- 1.1.8. No physical document shall be accepted unless and until the same is specifically stated in the RFP or it is a legal requirement.

2. SCHEDULE OF IMPORTANT EVENTS / ACTIVITIES

Sl. No.	EVENT(S)	DATE (Unless otherwise notified separately)
1.	Invitation of RFP (NIT)	20/05/2026
2.	Last date of receiving pre-bid queries	09/06/2025 till 05:00 pm
3.	Pre-Bid meeting at specified venue	10/06/2026 @ 11:00 am at IHMCL office Venue for pre-bid meeting – 2 nd Floor, Asia Bhawan, Sector – 9, Dwarka, New Delhi – 110077
4.	Last date/ time for online submission of bids (i.e. Bid Due Date)	Before 17:00 Hrs. 06/07/2026
5.	Opening of Technical bids	17:30 Hrs. 07/07/2026
6.	Opening of Financial bids	To be intimated to shortlisted/ pre-qualified Bidders separately
7.	Bid Validity	120 days from bid due date

3. GENERAL TERMS OF BIDDING

3.1. Brief description of Bidding Process

- 3.1.1 The Authority has adopted a single stage two part bidding process (collectively referred to as the "Bidding Process") for selection of the Bidder for award of the Project. Under this process, the Bid shall be invited under two parts. Eligibility and qualification of the Bidder (The "**Bidder**", which expression shall, unless repugnant to the context, include the members of the **JV/Consortium**) will be first examined based on the details submitted under the first part ("**Technical Bid**") with respect to eligibility and qualification criteria prescribed in this RFP. The Financial Bid under the second part ("**Financial Bid**") shall be opened of only those Bidders whose Technical Bids are responsive to eligibility and qualifications requirements as per this RFP.
- 3.1.2 Interested bidders (the "**Bidders**") are being called upon to submit their Bid in accordance with the terms specified in this Bidding Document. The Bid shall be valid for a period of 120 days from the date specified in Clause 2 for submission of Bids (the "**Bid Due Date**").
- 3.1.3 During the Bid Stage, Bidders are advised to examine the Project in greater detail, and to carry out, at their cost, such studies as may be required for submitting their respective Bids for award of the contract including implementation of the Project.

3.2. Tender Fee

- a) Bidder should pay Tender Application Fee (non-refundable) **Rs. 25,000/- (Rupees Twenty Five Thousand only)** through online mode. The Bidder shall also upload the online payment receipt.
- b) Details of designated bank account are as under:

S. No.	Particulars	Details
1.	Name of Beneficiary	Indian Highways Management Company Limited
2.	Name of Bank	Canara Bank
3.	Account No.	8598201006217
4.	IFSC Code	CNRB0008598

3.3. BID SECURITY

- 3.3.1. The Bidder shall furnish as part of its Bid, a Bid Security amounting to **Rs. 4.80 Cr. (Rupees four crore and eighty lakhs only)**. The Bid Security shall be in the form of Bank Guarantee (in format mentioned in this RFP) in favour of Indian Highways Management Company Limited, New Delhi from any of the following banks: -
- State Bank of India or its subsidiaries,
 - Any Indian Nationalised Bank

- iii. Any Scheduled Commercial Bank approved by RBI having a net worth of not less than Rs. 500 Cr. as per the latest Annual Report of the Bank. In the case of a Foreign Bank (issued by a branch in India), the net worth in respect of the Indian operations shall only be taken into account.
 - iv. A Foreign Bank (issued by a branch outside India) with a counter guarantee from SBI or its subsidiaries or any Indian Nationalised Bank.
- 3.3.2. Any bid not accompanied by a Bid Security and Tender Application Fee in the prescribed manner shall be summarily rejected.
- 3.3.3. The Bid Security of the unsuccessful Bidders will be returned within 30 days of award notification or expiration of the period of bid validity.
- 3.3.4. The Bid Security of the Selected Bidder shall be retained till it has provided Performance Security under the Contract Agreement.
- 3.3.5. Exemption to MSME Registered Firms
- a) Micro and Small Enterprises if registered with any government bodies specified by Ministry of Micro, Small & Medium Enterprises (M/o MSME) with valid certificate duly issued by GOI are exempted for submitting the Earnest Money Deposit (EMD). It will be applicable for those Bidders who shall produce their own goods or provide their own services, and not applicable for trading purpose. No entrepreneur or memorandum of application form is acceptable.
 - b) Only Firms registered with MSME / NSIC with valid certificate duly issued by GOI are exempted from submitting EMD. No other type of certificate is acceptable.
 - c) The firms registered under MSME shall be required to submit the Bid Securing Declaration Form as provided in Form T-14.
 - d) No exemption is allowed in case the Bidder is participating in the bid as JV/Consortium.

3.4. INVOCATION OF BID SECURITY:

- 3.4.1. The Bid Security shall be forfeited by IHMCL as damages payable to IHMCL for, inter-alia, time, cost and effort of IHMCL without prejudice to any other right or remedy that may be available to IHMCL under the provisions in the RFP and/or under the Contract, or otherwise, under the following circumstances:
- a. If a Bidder engages in a corrupt practice, fraudulent practice, coercive practice, undesirable practice or restrictive practice; or
 - b. If the Bid is withdrawn during the intervening period between the bid due date and the expiration of the Bid Validity; or
 - c. If the Bidder tries to influence the evaluation process; or
 - d. If a Bidder having been notified Successful Bidder by IHMCL through a Letter of Award (LOA) during the bid validity period:
 - i. Fails or refuses to furnish the Performance Security, in accordance with the conditions of RFP; or

- ii. Fails or refuses to execute/sign the Contract within the stipulated time frame.
- 3.4.2. No Bidder shall submit more than one Bid for the Project. A Bidder bidding individually or as a member of a JV/Consortium shall not be entitled to submit another Bid either individually or as a member of any JV/ Consortium, as the case may be.
- 3.4.3. Any condition or qualification or any other stipulation contained in the Bid shall render the Bid liable to rejection as a non-responsive Bid.
- 3.4.4. The Bidding documents including this RFP and all attached documents, provided by the Authority are and shall remain or become the property of the Authority and are transmitted to the Bidders solely for the purpose of preparation and submission of a Bid in accordance herewith. Bidders are to treat all information as strictly confidential and shall not use it for any purpose other than for preparation and submission of their Bid. The provisions of this Clause shall also apply mutatis mutandis to Bids and all other documents submitted by the Bidders, and the Authority will not return to the Bidders any Bid, document or any information provided along therewith.
- 3.4.5. Notwithstanding anything to the contrary contained herein, in the event that the Bid Due Date falls within three months of the closing of the latest financial year of a Bidder, it shall ignore such financial year for the purposes of its Bid and furnish all its information and certification with reference to the 3 (three) years or 7 (seven) years, as the case may be, preceding its latest financial year. For the avoidance of doubt, financial year shall, for the purposes of this Bid hereunder, mean the accounting year followed by the Bidder in the course of its normal business.

4. ELIGIBILITY AND PRE-QUALIFICATION CRITERIA

4.1. Pre-Qualification Criteria

The Bidders are required to fulfil the following Pre-Qualification Criteria:

SI #	Eligibility Conditions/Conditions	Supporting Document to be provided
PQ 1 – Entity	<p>The Bidder shall be one of the following:</p> <p>a) A business entity (“Sole Bidder”) incorporated under the Companies Act 1956/2013 or Limited Liability Partnerships Act 2008 or equivalent law/Act in the country of jurisdiction.</p> <p>OR,</p> <p>b) A JV/Consortium of business entities (“Consortium”), where each Member of the Consortium shall be incorporated under the Companies Act 1956/2013 or Limited Liability Partnerships Act 2008 or equivalent law/Act in the country of jurisdiction, subject to following points:</p>	<p>For Sole Bidder or all members of the Consortium</p> <p>i. Copy of Certificate of Incorporation / Registration under Companies Act, 1956/2013 or any equivalent foreign act, or Partnership deed, as applicable.</p> <p>ii. Power of Attorney for Lead Member of JV/Consortium as per the format enclosed at T-4</p> <p>iii. Power of Attorney/Letter</p>

SI #	Eligibility Conditions/Conditions	Supporting Document to be provided
	<p>i. members of the Consortium shall nominate one member as the lead member (the “Lead Member”), who shall be responsible for all interactions with IHMCL;</p> <p>ii. maximum number of members in the Consortium shall be two (2) including the Lead Member; However, in case any member of the JV/Consortium is a Start-up entity registered with DPIIT, Government of India, having demonstrable experience in the domain of AI/ML in past 3 years from bid due date, the JV/Consortium may comprise up to a maximum of three (3) members, including the Lead Member.</p> <p>iii. In case of a JV, each member shall hold not less than twenty-six percent (26%) of equity stake of the JV at all times during the Contract Period.</p> <p>iv. the members in the Consortium shall be jointly and severally liable;</p> <p>v. any entity who has submitted Proposal for this RFP in its individual capacity or as part of a Consortium cannot participate as a member of any other Consortium;</p> <p>vi. In case the Lead Member or any member of the Consortium is a foreign entity, such entity shall be required to obtain the requisite security clearance for undertaking business in India from the concerned authority of the Government of India, in accordance with the applicable extant guidelines and regulations.</p> <p>vii. The Sole Bidder or any member of a JV/Consortium from a country sharing a land border with India shall be eligible to participate only if the Bidder is registered with the Competent Authority, as per Government of India guidelines.</p> <p>The Sole Bidder / all members of a JV/Consortium shall be registered with GST in India. In case any member of the JV/Consortium is a foreign entity, the Bidder</p>	<p>of Authorization as per T-3</p> <p>iv. JV/Consortium Agreement as per format T-5</p> <p>v. GST Registration Certificate (in case of foreign entity, an undertaking on GST registration, as applicable)</p> <p>vi. <u>In case of Start up entity</u> – Work order/Completion certificates/ Project credential of working in the field of AI & ML as on bid due date.</p>

SI #	Eligibility Conditions/Conditions	Supporting Document to be provided
	<p>shall submit an undertaking along with its Proposal that, in the event of award, the said foreign member shall obtain GST registration within thirty (30) days of signing of the Contract Agreement.</p> <p>In case the Sole Bidder or any member of the consortium is a foreign entity, such entity shall submit an undertaking along with its Proposal that, in the event of award, the said foreign entity shall obtain requisite security clearance from the concerned authority of the Government of India within 90 days from the date of signing of the Contract Agreement.</p>	
PQ 2 - Annual Turnover	<p>The Sole Bidder or any Member(s) of the Consortium individually or combined (in case of Consortium) should have an average annual turnover of minimum Indian Rupees 200 Crore during last 3 (three) consecutive financial years, i.e. FY 2022-23, 2023-24, 2024-25</p> <p>Note:</p> <ol style="list-style-type: none"> In the case of a Joint Venture (JV)/Consortium, each member, excluding the Start-up entity, if any, shall individually have a minimum Average Annual Turnover (AAT) of not less than 26% of the prescribed minimum Average Annual Turnover (AAT) during the last three consecutive financial years, i.e., FY 2022-23, FY 2023-24, and FY 2024-25, and the cumulative AAT of all members of the JV/Consortium together shall meet the prescribed minimum requirement during the said period. For the purpose of this criterion, annual turnover of only the bidding entity will be considered. Annual turnover of any parent, subsidiary, associated or other related entity will not be considered. 	<p>For Sole Bidder or all members of the Consortium</p> <ol style="list-style-type: none"> Certificate from the Statutory Auditor^{\$} clearly specifying the annual turnover for the specified years in T-8, <p>And</p> <ol style="list-style-type: none"> Audited financial statements for the last three financial years, including Balance Sheets, Profit and Loss Statements, and Auditor's Reports of last 3 (three) consecutive financial years, i.e. FY 2022-23, 2023-24, 2024-25

^{\$} In jurisdictions that do not have statutory auditors, the firm of auditors which audits the annual accounts of the Bidder may provide the certificates required under this RFP.

SI #	Eligibility Conditions/Conditions	Supporting Document to be provided
PQ 3 - Net worth	<p>The Sole Bidder or all members of the JV/Consortium, in case of a Consortium, must have positive Net worth in Indian Rupees as on 31 March, 2025.</p> <p>For the purpose of this RFP, net worth (the "Net Worth") shall mean the aggregate value of the paid-up share capital and all reserves created out of the profits and securities premium account, after deducting the aggregate value of the accumulated losses, deferred expenditure and miscellaneous expenditure not written off, as per the audited balance sheet, but does not include reserves created out of revaluation of assets, write back of depreciation and amalgamation.</p> <p>For the purpose of this criterion, net-worth of only the bidding entity will be considered. Net-Worth of any parent, subsidiary, associated or other related entity will not be considered.</p>	<p>For sole Bidder or all members of the Consortium</p> <p>i. Certificate from the Statutory Auditor^s clearly specifying the net worth of the firm as on 31 March 2025 as per T-8</p>
PQ 4 - Relevant Experience on ICT	<p>The Sole Bidder or any Member(s) of the Consortium should have been successfully implemented/ completed large scale IT/ICT project(s) related to end-to-end IT system Implementation and Operation & Maintenance in India or abroad during last 7 (seven) years awarded by Central/State Government departments/entities including PSUs as on the Bid Due Date as below:</p> <ul style="list-style-type: none"> At least one project with contract value minimum Rs. 80 Crore <p>Or,</p> <ul style="list-style-type: none"> At least 2 projects with contract value minimum Rs. 60 Crore <p>Or,</p> <ul style="list-style-type: none"> At least 3 projects with contract value minimum Rs. 40 Crore <p>The project(s) should be either completed, or ongoing with the Operations & Maintenance (O&M) phase currently in progress.</p>	<p>For Sole Bidder or any Member(s) in case of a Consortium</p> <p>i. Work order(s)/ Contract Agreement(s) clearly highlighting the relevant scope of work, and contract value, year of execution.</p> <p>AND</p> <p>ii. Completion Certificate issued & signed by the competent authority of the client on the entity's letterhead</p> <p>IHMCL reserves the right to contact the afore-mentioned competent authority.</p>
PQ 5 - Relevant	<p>The Sole Bidder or any Member of the JV/Consortium, in case of JV/Consortium,</p>	<p>For Sole Bidder or any Member(s) in case of a Consortium</p>

SI #	Eligibility Conditions/Conditions	Supporting Document to be provided
Experience on ITS/ATMS Projects	<p>should have successfully implemented and commissioned any of following projects:</p> <p>a) Minimum cumulative length of 200 Kms of ITS/ATMS implemented in Highways / Expressways</p> <p>OR,</p> <p>b) Installation and Commissioning of IT field devices/ sensors such as CCTV surveillance systems/ANPR Camera, traffic monitoring systems, incident detection system, environmental sensors, communication networks (OFC/Wireless), command & control centre, of minimum contract value of Rs. 30 Crore (excluding taxes as applicable) under any Smart City project, city surveillance/safe city project, or airport CCTV surveillance project, in India or abroad, awarded by Central/State Government departments/entities including PSUs/Autonomous Bodies within last 7 (seven) years prior as on the Bid due date.</p> <p>Note: The project(s) should be either completed, or ongoing with the Operations & Maintenance (O&M) phase currently in progress.</p> <p>For the purpose of evaluation, a project shall qualify as an ITS/ATMS/Smart City Project/Safe city project, or Airport CCTV surveillance project only if it includes a dedicated Command and Control Center equipped with centralized integrated software application, video wall, along with ANY TWO of the following components:</p> <ol style="list-style-type: none"> Traffic monitoring or surveillance CCTV camera systems Automated video-based incident detection and enforcement solutions Vehicle speed violation detection solutions (e.g., radar, ANPR, or equivalent technologies) Advanced video analytics solution for traffic operations and/or incident management. 	<p>i. Work order(s)/ Contract Agreement(s) clearly highlighting the relevant scope of work, and contract value, year of execution.</p> <p>AND</p> <p>ii. Completion Certificate issued & signed by the competent authority of the client on the entity's letterhead</p> <p>IHMCL reserves the right to contact the afore-mentioned competent authority.</p>

SI #	Eligibility Conditions/Conditions	Supporting Document to be provided
PQ – 6 Certification	The Sole Bidder or, any member of the JV/Consortium, in the case of a JV/Consortium, shall have a valid CMMI Level 3 or higher certificate as on the Bid Due Date.	Copy of valid certificate
PQ – 7 Undertaking of Blacklisting	The Sole Bidder or, any member of the Consortium, in the case of a Consortium, should not be blacklisted or debarred by any government department/ agency/PSU for material non-performance or contractual non-compliance in India or abroad as on bid due date.	Self-declaration to this effect shall be submitted as part of the Bid as per format T-1
PQ 8 - Undertaking of Insolvency, bankruptcy	A Bidder who has had any proceedings for insolvency or bankruptcy shall not be considered eligible to participate in this global tender. This includes: Insolvency Proceedings: Any legal proceedings initiated under the applicable insolvency laws of any country for the resolution of insolvency of the Bidder. Any admission of an insolvency application by a competent court or tribunal against the Bidder. Bankruptcy Proceedings: Any legal declaration of bankruptcy by a competent court in any jurisdiction. Any bankruptcy order passed by a court or tribunal that declares the Bidder unable to pay its debts.	Self-declaration to this effect shall be submitted as part of the Bid as per Format T-1

Note:

- i. For projects where contract value or any amount is in any currency other than Indian Rupees, then the foreign currency conversion rate available on Reserve Bank of India's portal as on the date of release of the RFP document shall be used for conversion of amount in foreign currency to Indian Rupees equivalent.

4.2. Eligible Goods and Services, and Original Equipment Manufacturer (OEM) Criteria

(Undertaking as per format in T-7):

- a) For purposes of this Clause, the term "goods" includes commodities, raw material, machinery, equipment, and industrial plants; and "related services" includes services such as insurance, transportation, supply, installation, integration, testing, commissioning, training, and initial maintenance.
- b) OEM of each component/ equipment shall be preferably Indian OEM/ Manufacturers or preferably Class-I Local supplier (as defined in DPIIT Order no. P-45021/2/2017-PP (BE-II) dated 04.06.2020 (revised "Public Procurement (Preference to Make in India) Order 2017") having direct presence in India and own service and support

offices to ensure smooth after sales service support on site.

- c) Bidders must comply with the Office Memorandum no. F. No. NH-35014/20/2020-H, Government of India, Ministry of Road Transport & Highways dated 04.08.2020, regarding Department of Expenditure (DoE), Ministry of Finance, Govt. of India O.M. No. 6/18/2019-PPD dated 23.07.2020, vide which Rule 144 of the general Financial Rules 2017 entitled 'Fundamental principles of public buying' has been amended by inserting sub-rule 144 (xi) in the General Financial Rules (GFRs), 2017. As per the new rule **"Any Bidder from a country which shares a land border with India will be eligible to bid in any procurement whether of goods, services (including consultancy services and non-consultancy services) or works (including turnkey projects) only if the Bidder is registered with the Competent Authority."** The Bidder shall furnish the registration status of the supplier with Competent Authority (for the items / goods proposed to be procured from any country which shares a land border with India).

For determining the eligibility of Bidder from a country which shares a land border with India the following shall apply:

(i) Any Bidder from a country which shares a land border with India will be eligible to bid, only if the Bidder is registered with the Competent Authority, specified in Annexure-I of Order (Public Procurement No. 1) issued by Ministry of Finance, Department of Expenditure Public Procurement Division vide F. No. 6/18/2019-PPD, dated 23rd July 2020, which shall form an integral part of RFP and DCA.

(ii) "Bidder from a country which shares a land border with India" means:

- a) An entity incorporated, established or registered in such a country, or
- b) A subsidiary of an entity incorporated, established or registered in such a country; or
- c) An entity substantially controlled through entities incorporated, established or registered in such a country; or
- d) An entity whose beneficial owner is situated in such a country; or
- e) An Indian (or other) agent of such an entity; or
- f) A natural person who is a citizen of such a country; or
- g) A Consortium or joint venture where any member of the consortium or joint venture falls under any of the above.

(iii). Beneficial owner for the purpose of (ii) above means:

1. In case of a company or Limited Liability Partnership, the beneficial owner is the natural person(s), who, whether acting alone or together, or through one or more judicial person, has a controlling ownership interest or who exercises control through other means.

Explanation:

- a) “Controlling ownership interest” means ownership of or entitlement to more than twenty-five per cent of shares or capital or profits of the company.
- b) “Control” shall include the right to appoint majority of the directors or to control the management or policy decisions including by virtue of their shareholding or management rights or shareholding agreements or voting agreements;

2. In case of a partnership firm, the beneficial owner is the natural person(s) who, whether acting alone or together, or through one or more juridical person: has ownership of entitlement to more than fifteen percent of capital or profits of the partnership;

3. In case of an unincorporated association or body of individuals, the beneficial owner is the natural person(s), who, whether acting alone or together, or through one or more juridical person, has ownership of or entitlement to more than fifteen percent of the property or capital or profits of such association or body of individual;

4. Where no natural person is identified under (1) or (2) or (3) above, the beneficial owner is the relevant natural person who holds the position of senior managing official;

5. In case of a trust, the identification of beneficial owner(s) shall include identification of the author of the trust, the trustee, the beneficiaries with fifteen percent or more interest in the trust and any other natural person exercising ultimate effective control over the trust through a chain of control or ownership.

(iv). An Agent is a person employed to do any act for another, or to represent another in dealings with third person.

(v) The Selected Bidder / ATMS Contractor shall not be allowed to sub-contract works to any contractor from a country which shares a land border with India unless such contractor is registered with the Competent Authority. The definition of “contractor from a country which shares a land border with India” shall be as in Clause 2.2.1(e)(ii) above.

Certificate regarding Compliance:

A certificate on the letterhead of the Bidder shall be required to be submitted by the bidders certifying the following in the format prescribed at Form T-16 in RFP:

"I have read the clause regarding restrictions on procurement from a bidder of a country which shares a land border with India and on sub-contracting to contractors from such countries;

I/We certify that this bidder is not from a country or, if from such a country, has been registered with the Competent Authority as defined in Public Procurement Order no. F.no.6/18/2019- PPD dated 23rd July 2020 and will not sub-contract any work to a contractor from such countries unless such contractor is registered with the Competent Authority;

I hereby certify that this bidder fulfils all requirements in this regard and is eligible to be considered."

It may be noted that in case the above certification is found to be false, this would be a ground for immediate rejection of Bid/termination and further legal action in accordance with law.

Validity of Registration:

In respect of RFP, registration should be valid at the time of submission of bids and at the time of acceptance of bids. If the Bidder was validly registered at the time of acceptance, registration shall not be a relevant consideration during contract execution.

- d) That the OEM should not be rebranding & reselling products in India through importing/trading from a country that shares a Land Border with India.
- e) That the source code of the Software and Firmware being supplied for all the relevant equipment being supplied against this bid does not reside in any Country that shared a Land Border with India.
- f) All goods quoted by the Bidder must be associated with item code and names and with printed literature describing configuration and functionality.
- g) The OEM for each product or technology quoted should be in the business of that product or solution or technology for at least 3 years as on the date of release of the RFP.
- h) The OEM for all active components should give a declaration that products or technology quoted are neither end-of-sale nor end-of-life as on the date of installation and commissioning and are not end-of-support till the successful completion of O&M period of the project.
- i) The Bidder's proposed OEM should not have been blacklisted by any State / Central Government Department or Central /State PSUs as on bid submission date.
- j) Each of the proposed OEMs should have capability and infrastructure to provide 24x7x365 technical support in India.

- k) Adequate supporting documents pertaining to the above points, along with a summary compliance table, should be submitted in the technical proposal by the Bidder.
- l) All CCTV Cameras OEMs proposed under this project must fully comply with all applicable regulatory guidelines, standards, and certifications as prescribed by the Government of India. Documentary evidence of such compliance must be submitted prior to commencement of System Acceptance Testing (SAT). Failure to comply with this requirement shall constitute a material breach of the Contract, entitling the Purchaser to take appropriate remedial action, including but not limited to replacement of non-compliant cameras, termination of the Contract and forfeiture of performance security.

4.3. Conflict of Interest

- 4.3.1. A Bidder shall not have a conflict of interest that may affect the Bidding Process (the "Conflict of Interest"). Any Bidder found to have a Conflict of Interest shall be disqualified. In the event of disqualification, IHMCL shall invoke the Bid Securing Declaration as mutually agreed genuine pre-estimated loss and damage likely to be suffered and/ or incurred by the IHMCL and not by way of penalty for, inter alia, the time, cost and effort of IHMCL including consideration of such Bidder's Bids, without prejudice to any other right or remedy that may be available to IHMCL hereunder or otherwise.
- 4.3.2. IHMCL requires that the Selected Bidder provide professional, objective, and impartial advice and at all times hold IHMCL's interest's paramount, avoid conflicts with other assignments or its own interests. The Selected Bidder shall not accept or engage in any assignment that would be in conflict with its prior or current obligations to other clients, or that may place it in a position of not being able to carry out the assignment in the best interests of IHMCL.
- 4.3.3. A Bidder shall be deemed to have a Conflict of Interest affecting the bidding process, if:
 - 4.3.3.1. A constituent¹ of Bidder is also a constituent of another Bidder; or
 - 4.3.3.2. Such Bidder, or any of its JV/Consortium member thereof or its associate receives or has received any direct or indirect subsidy, grant, concessional loan or subordinated debt from any other Bidder, or any of its JV/Consortium member thereof or its associate or has provided any such subsidy, grant, concessional loan or subordinated debt to any other Bidder or any of its JV/Consortium member thereof or its associate; or
 - 4.3.3.3. Such Bidder has the same legal representative for purposes of this Bid as any other Bidder; or
 - 4.3.3.4. Such Bidder, or any of its JV/Consortium member or its associates has a relationship with another Bidder, or any of its JV/Consortium member or its associates, directly or through common third party/parties, that puts either or both of them in a position to have access to each other's information about the bids, or if they actually share or access each other's information

¹ For the purpose of this clause the word "constituent" shall include Promoter, Director, Shareholder, Partner, Agent, representative etc.

regarding the bids or to influence the bid of either or each of the other Bidder;
or

- 4.3.3.5. There is a conflict among this and other assignments of the Bidder (including its member, associates, personnel and subordinates) and any subsidiaries or entities controlled by such Bidder or having common controlling shareholders. The duties of the Bidder will depend on the circumstances of each case. While providing services to IHMCL for this particular assignment, the Bidder shall not take up any assignment that by its nature will result in conflict with the present assignment; or
- 4.3.3.6. A Company/firm which has been engaged by the Authority to provide goods and/or works and/or services for a project, and its associates, will be disqualified from providing consulting services for the same project and/or associated services, conversely, a firm hired to provide services for the preparation or implementation of a project, and its associates, will be disqualified from subsequently providing goods or works or services related to the same project and/or associated services; or
- 4.3.4. Bidders should be deemed to be in a conflict of interest situation if it can be reasonably concluded that their position in a business or their personal interest could improperly influence their judgment in the exercise of their duties. The process for selection of Bidders should avoid both actual and perceived conflict of interest; or
- 4.3.5. The Bidder, or any of its JV/Consortium member or Associate (or any constituent thereof) and any other Bidder, or any of its JV/Consortium member or any Associate thereof (or any constituent thereof) have common controlling shareholders or other ownership interest; provided that this disqualification shall not apply in cases where the director in direct shareholding of a Bidder, or any of its JV/Consortium member or an Associate thereof (or any shareholder thereof having a shareholding of not more than 25%(twenty five percent) of the paid up and subscribed capital; of such Bidder, Member or Associate, as the case may be) in the other Bidder, its Member or Associate, is not more than 25% (Twenty five percent) of the subscribed and paid up equity share capital thereof; provided further that this disqualification shall not apply to any ownership by a bank, insurance company, pension fund or a public financial institution referred to in section 4A of the Companies Act, 1956/2013. For the purposes of this Clause, indirect shareholding held through one or more intermediate persons shall be computed as follows: (aa) where any intermediary is controlled by a person through management control or otherwise, the entire shareholding held by such controlled intermediary in any other person (the "Subject Person") shall be taken into account for computing the shareholding of such controlling person in the Subject Person; and (bb) subject always to sub-clause (aa) above, where a person does not exercise control over an intermediary, which has shareholding in the Subject Person, the computation of indirect shareholding of such person in the Subject Person shall be undertaken on a proportionate basis; provided, however, that no such shareholding shall be reckoned under this sub-clause (bb) if the shareholding of such person in the intermediary is less than 26% of the subscribed and paid up equity shareholding of such intermediary; or
- 4.3.6. For purposes of this RFP Document, Associate means, in relation to the Bidder, a person who controls, is controlled by, or is under the common control with such Bidder. As used in this definition, the expression "control" means, with respect to a person which is a company or corporation, the ownership, directly or indirectly, of more than 50% (fifty per cent) of the voting shares of such person, and with respect

to a person which is not a company or corporation, the power to direct the management and policies of such person by operation of law or by contract.

- 4.3.7. The normal way to identify conflicts of interest is through self-declaration by the Bidder. Where a conflict exists, which has not been declared, competing companies are likely to bring this to the notice of IHMCL. All conflicts must be declared as and when the Bidder becomes aware of them.

5. CLARIFICATION REGARDING RFP DOCUMENT

A prospective Bidder requiring any clarification regarding the RFP may notify IHMCL in writing or e-mail at IHMCL's address indicated in the invitation to Bid. IHMCL will respond to any request for clarification which is received before the pre-Bid meeting.

5.1. Site Visit

- 5.1.1. Before the pre-bid meeting date, Bidders are strongly advised and encouraged to conduct site visits, including visits to the toll plaza/ATMS Control Centre location(s), to assess the existing situation and gather information relevant to their bid proposal. The Authority strongly advises and encourages Bidders to address any questions they may have about the site conditions through a pre-bid inquiry. Failing which, it shall be deemed that the Bidder has fully satisfied itself about the site conditions as outlined in the Contract Agreement.
- 5.1.2. The Bidder shall not hold the Authority responsible or liable for any inconsistencies, inaccuracies, mismatches, or errors that may arise between the Contract Agreement and the actual site conditions.
- 5.1.3. Bidders must adhere to all safety and security protocols during site visits. The Authority reserves the right to limit or restrict access to certain areas of the site, or to impose conditions on site visits as deemed necessary for safety, security, or operational reasons.
- 5.1.4. The Authority makes no representations or warranties regarding the accuracy, completeness, or suitability of the information gathered by Bidders during site visits, and Bidders undertake their own risk assessment and due diligence based on such information.
- 5.1.5. Bidders agree that their proposals are based on their independent analysis and expertise, and they shall not hold the Authority liable for any discrepancies, omissions, or inaccuracies in the information gathered by the Bidders during site visits.
- 5.1.6. Bidders agree to indemnify and hold harmless the Authority, its officers, employees, and agents against any claims, damages, liabilities, or expenses that may arise because of or in connection with their site visit activities.

5.2. PRE-BID MEETING

- 5.2.1. The Bidder or his authorized representative is invited to attend a pre-Bid meeting which will take place at IHMCL, Asia Bhawan, Sector-9, Dwarka, New Delhi-110077 as mentioned in the Schedule of Events.

- 5.2.2. The Bidders who are interested in attending the pre-bid meeting should confirm their participation to IHMCL one day prior to the schedule. The confirmation can be sent to tenders@ihmcl.com
- 5.2.3. The purpose of the meeting will be to clarify issues and to answer questions on any matter pertaining to this RFP document. All Bidders are requested to go through the RFP document carefully and submit any queries/ clarifications addressed to the COO, IHMCL in the format prescribed in Part III. The Bidder is requested to submit any questions / queries in writing or by email in editable MS excel format using Form T-10 to tenders@ihmcl.com so as to reach IHMCL well before the scheduled meeting.
- 5.2.4. Clarifications to the queries will be hosted on IHMCL's website/ e-tender portal only.
- 5.2.5. Any modification in the RFP document which may become necessary as a result of the deliberations in the pre-Bid meeting shall be made by IHMCL separately through issue of an Addendum/ Amendment will be hosted on IHMCL's website/ e-tender portal.

6. ACCESSING BID DOCUMENTS, PREPARATION AND SUBMISSION OF BID

Detailed RFP document can be viewed / downloaded from IHMCL e-tender portal.

Website for accessing RFP is <http://etenders.gov.in>. The Bidders shall submit the proposal as per criteria laid down in the RFP. The tender process timelines are mentioned in the RFP as Schedule of the Tender.

6.1. PREPARATION & SUBMISSION OF BIDS:

- i. Detailed **RFP** may be downloaded from IHMCL's e-tender portal of IHMCL and bid shall be submitted online following the instruction appearing on the screen.
- ii. The scanned copies of the following documents shall be submitted as part of bid to IHMCL before the prescribed date & time for submission of Bids.
 - a. Tender Application Fee in the manner prescribed.
 - b. Bid Securing Declaration in the manner prescribed.
 - c. Original Power of Attorney in favour of Authorized Signatory in the Format prescribed in this document.
 - d. if applicable, Power of Attorney for Lead Member of JV/ Consortium in the format prescribed in this document.
 - e. if applicable, Joint Bidding Agreement for JV/ Consortium in the format prescribed in this document.
- iii. The Technical and Financial bid should be submitted online only in the prescribed format given on the e-tender portal. No other mode of submission is accepted.

6.2. Bid Validity

The bid should remain valid for a period of 120 calendar days from the bid due date. IHMCL will make its best efforts to complete the evaluation process and work award within the bid

validity period. Under exceptional circumstances, prior to expiry of the bid validity, IHMCL may request Bidder to extend the bid validity for specified additional period. Such request by IHMCL and reply / response from Bidder shall be in writing. The bidder(s) not agreeing to such extension will be allowed to withdraw their bids without invocation of their Bid Securing Declaration.

6.3. Bid Composition:

The Bid shall comprise the following:

6.3.1. PART 1 Technical Bid

To be uploaded on E-tender portal only. Physical submission of bids is not allowed)

- i. Tender Fee (proof of deposition in given account No)
- ii. EMD/Bid Security or Bid Securing Declaration, as the case may be.
- iii. Technical Bid comprising various formats Form T-1 to Form T-18 prescribed in RFP.
- iv. Stipulated documentary evidence attested by the authorised signatory in support of their claim fulfilling the prescribed eligibility criteria and an undertaking on the Bidder's letterheads to the fairness of these documents in support of their claim while submitting the Bids
- v. Undertaking that the Bidder has not been determined non-performing or having been terminated any of his project during last three years by Ministry of Road Transport & Highways, Government of India or its executing agencies like IHMCL, NHIDCL etc. or any other Ministry / PSU / State / Central Government or its Department/ Enforcement agencies/ Autonomous Body etc.
- vi. Undertaking that the Bidder has not been blacklisted/declared ineligible by Ministry of Road Transport & Highways, Government of India or its executing agencies like IHMCL, NHIDCL etc. or any other Ministry / PSU / State / Central Government or its Department/ Enforcement agencies/ Autonomous Body etc.
- vii. Self-declaration i.r.o. any conflict of interest prescribed under para 4.3 of eligibility criteria;
- viii. Other documents
 - a. Work Orders/Completion Certificates/Declarations in respect of Eligibility Criteria
 - b. Copy of Certificate of Incorporation of Company.
 - c. MoA and AoA of the Company / or other document showing object clause of the firm; and
 - d. Signed copy of Integrity Pact in the prescribed format;
 - e. Any other document providing additional information in respect of technical / financial strength as well as technical experience etc.
- ix. Technical Design Plan (as per form T-9 and T-13)
 - a. The Bidder shall describe the proposed works in sufficient detail in his Technical Proposal as per format given in T-9 to enable the IHMCL to evaluate the technical adequacy of the proposed system. Authority may ask clarification,

and if not found satisfactory response, the technical bid shall be declared non-responsive.

- b. Any other relevant information

6.3.2. **PART 2 Financial Bid**

(In the prescribed format on E-Tender portal of IHMCL)

- a. Financial bid shall be submitted online on e-tender portal on the prescribed format which may be downloaded well before the bid due date from e-tender portal.
- b. The bid should include all the charges payable in full compliance to the Scope of Work and other terms specified in the RFP document. No additional payments whatsoever are envisaged.
- c. The bid should include all statutory taxes/ levies / surcharge on tax etc. but excluding service tax/ GST (as applicable on services). Any tax, and / or any other levies, if altered in future and payable under the law, the same shall be borne by the Bidder.
- d. Applicable GST shall be reimbursed by IHMCL separately on production of proof of payment; and
- e. Bidder should note that Income tax payable by the Bidder is not reimbursable by IHMCL. TDS will be applicable on all payments made by IHMCL as per applicable law.
- f. In case of any difference in figures and words, the amount mentioned in words will prevail.

NOTE: Original documents in physical form -Physical Submission of original Bid Security or Bid Securing Declaration, as the case may be, POA for signing the Bid, POA in favor of lead member of JV, if any, JBA for JV, if any, Integrity Pact, and experience certificates apostle at foreign origin, if any, **shall only be required to be submitted by the Bidders after declaration of Bid Evaluation Result** by the Authority. Bidders (including individual or any of its JV/Consortium Members) failing to submit the original documents required as per above shall be unconditionally debarred from bidding in IHMCL projects for a period of 5 years.

6.4. **COST OF BIDDING**

The Bidder shall be responsible for all the costs associated with the preparation and submission of their Bids including subsequent negotiation, visits to IHMCL, project site etc. IHMCL shall not be responsible in any way liable for such costs, regardless of the conduct or outcome of the Bidding Process.

6.5. **LANGUAGE OF THE BIDS**

The Bid and all communications in relation to or concerning the RFP shall be in **English language**. No supporting document or printed literature shall be submitted with the Bid unless specifically asked for and in case any of the documents are in another language, it

must be accompanied by an accurate translation of the relevant passages in English, in which case, for all purposes of interpretations of the Bid, the original documents attached with the bid or the information incorporated in the bid shall be final and binding.

6.6. MODIFICATION /SUBSTITUTION/ WITHDRAWAL OF BIDS:

- i. The Bidder may modify, substitute or withdraw its e-bid after submission prior to the Bid Due Date. No Bid shall be modified, substituted or withdrawn by the Bidder on or after the Bid Due Date.
- ii. Any alternative/modification in the Bid or additional information supplied subsequent to the Bid Due Date, unless the same has been expressly sought for by the Authority, shall be disregarded.
- iii. For modification or e-bid, Bidder has to click on Edit Bid Option and resubmit digitally signed modified bid.
- iv. For withdrawal of bid, Bidder has to click on withdrawal icon at e-tendering portal and can withdraw its e-bid.
- v. Before withdrawal of a bid, it may specifically be noted that after withdrawal of a bid for any reason, Bidder cannot re-submit e-bid again.

6.7. OPENING & EVALUATION OF BIDS

- 6.7.1. To assist in the examination, evaluation, and comparison of Bids, IHMCL may, at its discretion, ask any Bidder for clarification of its Bid. The request for clarification and the response shall be in writing or by fax or e-mail, but no change in the price or substance of the Bid shall be sought, offered, or permitted except as required to confirm the correction of arithmetic errors discovered by IHMCL in the evaluation of the Bids.
- 6.7.2. Except in case any clarification is asked by IHMCL, no Bidder shall contact IHMCL on any matter relating to its Bid from the time of the Bid opening to the time the Contract is awarded. If any Bidder wishes to bring additional information to the notice of IHMCL, it should do so in writing at the address prescribed in the Notice Inviting Tender.

6.8. BID EVALUATION CRITERIA AND SELECTION PROCEDURE

- 6.8.1. The bids shall be opened online by the Evaluation Committee on the date and time prescribed. Prior to evaluation of the bids, IHMCL shall determine as to whether each bid is responsive to the requirements of this RFP document. A bid will be declared non-responsive in case:
 - (a) If a Bidder does not fulfil Technical and Financial pre-qualification criteria mentioned at **4.1**
 - (b) If a Bidder submits more than one bid against this RFP
 - (c) Bid is submitted without Tender Fee
 - (d) Bid is submitted without Bid Security
 - (e) If the Authorized Signatory holding Power of Attorney (POA) or the person

executing/delegating such POA and Digital Signatory are not the same

- (f) If a Bidder submits a conditional bid or makes changes in the terms and conditions given in this RFP document
- (g) Failure to comply with all the requirements of RFP document by a Bidder
- (h) If the bid is not submitted in the formats prescribed in the RFP document
- (i) If any requisite document/ certificate is not in the prescribed format the same shall not be considered while evaluating the bids and the same may lead to bid being declared as non-responsive.
- (j) A bid valid for a period of time shorter than prescribed in the RFP document

6.8.2. A three-stage procedure shall be adopted for evaluation of the bids.

6.8.3. The stages of bid evaluation are mentioned as below: –

6.8.3.1. First Stage: Pre-Qualification/ Eligibility Stage:

- a) The Evaluation Committee shall carry out initial screening of technical bids by examining the statement of qualification, furnished by the Bidder in support of their fulfilment of eligibility against the criteria prescribed in this RFP.
- b) The Bidder shall have to submit all the required documents as per the various formats provided in the Appendices. These documents will be scrutinized in this phase of evaluation. Those Bidders who do not fulfil the terms and conditions of Eligibility Criteria as specified in this tender will not be eligible for further evaluation.

6.8.3.2. Second Stage: Technical Qualification/ Technical Scoring

- a) Based upon the evaluation of the documents and the conditions specified in the RFP, IHMCL shall announce the names of the Bidders who have qualified for Second Stage - Technical Qualification. It is hereby clarified that Technical Qualification evaluation of only such Bidders who are declared qualified as stated herein shall be performed.
- b) The Technical Proposals of the Bidders shall be evaluated based on the Technical Evaluation Framework as listed in the Table below and marks (ST) shall be provided accordingly.

Section #	Evaluation Criteria	Total Marks
A	Bidder Profile	20
B	Relevant Project Experience	50
C	Approach & Methodology	20
D	Key Resources	10
Overall Technical Score Total (ST)		100

- c) Detailed Technical Scoring Criteria are as below -

Sl. #	Technical Evaluation Criteria	Maximum Marks	Supporting Document required
A.	Bidder Profile	20	
A1	<p>Average Annual Turnover Average annual turnover of the Sole Bidder or any Member(s) of the Consortium individually or combined, in case of Consortium, during last three consecutive financial years, i.e. FY 2022-23, 2023-24, 2024-25</p> <p>Marks shall be allotted as given below:</p> <ul style="list-style-type: none"> Average annual turnover >Rs. 300 Crore = 10 marks Average annual turnover >= Rs. 200 Crore and up to Rs. 300 Crore = 5 marks Average annual turnover < Rs. 200 Crore = 0 marks <p>For the purpose of this criterion, annual turnover of only the bidding entity will be considered. Annual turnover of any parent, subsidiary, associated or other related entity will not be considered.</p>	10	<ul style="list-style-type: none"> Certificate from the Statutory Auditor^{\$} clearly specifying the annual turnover for the specified years And Audited financial statements for the last three financial years, including Balance Sheets, Profit and Loss Statements, and Auditor's Reports of last 3 (three) consecutive financial years, i.e. FY 2022-23, 2023-24, 2024-25
A2	<p>Certification The Sole Bidder or, any member of the Consortium, in the case of a Consortium, shall have a valid CMMI Level 3 or higher certificate as on the Bid Due Date.</p> <ul style="list-style-type: none"> Valid CMMI Level 5 certificate = 5 marks Valid CMMI Level 3 or 4 certificate = 3 marks 	5	<ul style="list-style-type: none"> Valid copy of relevant certificate

^{\$} In jurisdictions that do not have statutory auditors, the firm of auditors which audits the annual accounts of the Bidder may provide the certificates required under this RFP.

Sl. #	Technical Evaluation Criteria	Maximum Marks	Supporting Document required
A3	<p>Start-up Entity</p> <p>In case a Start-up entity duly recognized by DPIIT, Government of India, having demonstrable experience in the domain of AI/ML in past 3 years from bid due date, is a member of the JV/Consortium, marks shall be awarded as follows:</p> <ul style="list-style-type: none"> • If any Start-up is part of JV/Consortium – 5 Marks • No Start-up as a part of JV/Consortium – 0 Marks 	5	<p><u>For the Start-up entity, as applicable:</u></p> <p>Work Order(s)/Contract Agreement(s) clearly indicating the scope of work carried out in the field of AI/ML, along with Completion Certificate(s) duly issued and signed by the competent authority of the client.</p> <p>Only completed project or Project which has achieved Go-Live and currently under O&M phase shall be considered for evaluation.</p>
B.	Relevant Project Experience	50	

Sl. #	Technical Evaluation Criteria	Maximum Marks	Supporting Document required
B1	<p>The Sole Bidder or any Member(s) of the Consortium individually or combined (in case of Consortium) should have implemented, and successfully commissioned Traffic Monitoring Camera System / ANPR Camera System/ CCTV Surveillance Cameras System under any Smart City project, city surveillance/safe city project, or airport CCTV surveillance project, in India or abroad, awarded by Central/State Government departments/entities including PSUs/Autonomous Bodies within last seven 7 years prior as on the Bid due date.</p> <p>Marks shall be allotted as given below:</p> <ul style="list-style-type: none"> • Cumulative number of cameras commissioned > 500 cameras – 20 marks • Cumulative number of cameras commissioned - from 401 to 500 – 15 Marks • Cumulative number of cameras commissioned - from 301 to 400 – 10 Marks • Cumulative number of cameras commissioned - from 200 to 300 – 5 Marks • Cumulative number of cameras commissioned - less than 200 – 0 Mark <p>Only completed project or Project which has achieved Go-Live and currently under O&M phase shall be considered for evaluation.</p>	20	<ul style="list-style-type: none"> • Work order(s)/ Contract Agreement(s) clearly highlighting the relevant scope of work, and contract value, year of execution. <p>AND</p> <ul style="list-style-type: none"> • Completion Certificate issued & signed by the competent authority of the client on the entity's letterhead <p>IHMCL reserves the right to contact the afore-mentioned competent authority.</p>

Sl. #	Technical Evaluation Criteria	Maximum Marks	Supporting Document required
B2	<p>The Sole Bidder or any Member(s) of the Consortium individually or combined (in case of Consortium) should have experience of Installation and Commissioning of IT field devices/ sensors such as CCTV surveillance systems/ANPR Camera, traffic monitoring systems, incident detection system, environmental sensors, communication networks (OFC/Wireless), command & control centre under any Smart City project, city surveillance/safe city project, or airport CCTV surveillance project, in India or abroad, awarded by Central/State Government departments/entities including PSUs/Autonomous Bodies within last seven 7 years prior as on the Bid due date.</p> <p>Marks shall be allotted as given below:</p> <p>Each project with contract value minimum Rs. 30 Crore (excl. taxes as applicable) = 10 marks, subject to maximum of 20 marks</p> <p>Only completed project or Project which has achieved Go-Live and currently under O&M phase shall be considered for evaluation.</p> <p>For the purpose of evaluation of this criterion, a project shall be considered only if it includes a dedicated Command and Control Center equipped with centralized integrated software application, video wall, along with ANY TWO of the following components:</p> <ol style="list-style-type: none"> Traffic monitoring or surveillance CCTV camera systems Automated video-based incident detection and enforcement solutions Vehicle speed violation detection solutions (e.g., radar, ANPR, or equivalent technologies) Advanced video analytics solution for traffic operations and/or incident management. 	20	<ul style="list-style-type: none"> Work order(s)/ Contract Agreement(s) clearly highlighting the relevant scope of work, and contract value, year of execution. <p>AND</p> <ul style="list-style-type: none"> Completion Certificate issued & signed by the competent authority of the client on the entity's letterhead <p>IHMCL reserves the right to contact the afore-mentioned competent authority.</p>

Sl. #	Technical Evaluation Criteria	Maximum Marks	Supporting Document required
B3	<p>The Sole Bidder or any Member(s) of the Consortium individually or combined (in case of Consortium) should have experience in implementation of projects involving laying of Optical Fibre Cable (OFC) infrastructure in India or abroad, awarded by Central/State Government departments/entities including PSUs/Autonomous Bodies within last seven 7 years prior as on the Bid due date.</p> <p>Marks Distribution :</p> <ul style="list-style-type: none"> Cumulative OFC Implementation > 1500 km = 10 Marks Cumulative OFC Implementation 1001 – 1500 km = 8 Marks Cumulative OFC Implementation 500 – 1000 km = 5 Marks <p>Only completed project or Project which has achieved Go-Live and currently under O&M phase shall be considered for evaluation.</p>	10	<ul style="list-style-type: none"> Work order(s)/ Contract Agreement(s) clearly highlighting the relevant scope of work, and contract value, year of execution. AND Completion Certificate issued & signed by the competent authority of the client on the entity's letterhead <p>IHMCL reserves the right to contact the afore-mentioned competent authority.</p>
C	Approach & Methodology	20	
C1	<p>Approach & Methodology</p> <ul style="list-style-type: none"> Demonstrated level of understanding of the scope of work and other aspects of the project – 15 Marks <p>and</p> <ul style="list-style-type: none"> Project implementation plan, Work Break Down Schedule, Manpower Deployment Plan, Strategy for compliance to SLA defined – 5 marks 	20	<p>Assessment to be based on Proposal Submitted & Presentation made by Bidder before the Tender Evaluation Committee.</p>
D	Key Resources	10	

Sl. #	Technical Evaluation Criteria	Maximum Marks	Supporting Document required
D1	<p>Project Director</p> <p>Minimum requirement</p> <ol style="list-style-type: none"> Education: Full-Time MBA/MCA/M. Tech & B. Tech/B.E. from a reputed institute Total Experience: At least 15 years in IT/ITS sector <p>Marks distribution:</p> <ul style="list-style-type: none"> Experience more than 20 years – 5 marks Experience – from 15 years – 20 years – 3 marks 	5	CV to be attached in the Technical Proposal as per format provided in the RFP
D2	<p>Project Manager</p> <p>Minimum requirement</p> <ol style="list-style-type: none"> Education: Full-Time MBA/MCA/M. Tech & B. Tech/B.E. from a reputed institute Total Experience: At least 10 years in IT/ITS sector <p>Marks distribution:</p> <ul style="list-style-type: none"> Experience more than 15 years – 5 marks Experience – from 10 years – 15 years – 3 marks 	5	CV to be attached in the Technical Proposal as per format provided in RFP

- Bidders, whose bids are responsive, based on minimum qualification criteria as in Pre-Qualification Criteria and score (ST) at least **70 marks out of total 100** from the technical evaluation criteria would be considered technically qualified and shall be considered for Third Stage – Financial Bid Evaluation.
- Evaluation Committee may, at its discretion, call for additional information from the Bidder(s) through email/fax/telephone/meeting or any other mode of communication. Such information has to be supplied within the set-out time frame as provided by Evaluation Committee; otherwise, Evaluation Committee shall make its own reasonable assumptions at the total risk and cost of the Bidders and the proposal is liable to be rejected. Seeking clarifications cannot be treated as acceptance of the proposal. For verification of information submitted by the Bidders, the committee may visit the Bidder's offices at its own cost. The Bidders shall provide all the necessary documents, samples, and reference information as desired by the Committee. The Bidders shall also assist the committee in obtaining relevant information from their references.

6.8.3.3. Third Stage: Financial Bid Evaluation

- a) The Financial Bids of technically qualified Bidders will be opened on the prescribed date on e-tender portal.
- b) The Financial Bid Evaluation will be based on the Total Cost quoted by the Bidder in the Financial Bid Form F-1

6.8.4. Site Visit and/or Technical Presentation to IHMCL

Before completing technical evaluation, IHMCL officials may visit the Highway Project / Smart City where the Bidder has claimed to have successfully implemented ATMS. In case of any discrepancy/mismatch is found during the site visit/ remote access with respect to credentials submitted in the bid, the bid is liable to be declared non-responsive. Also, IHMCL may invite all responsive Bidders to make a detailed technical presentation to IHMCL. Schedule of technical presentation shall be informed. Each responsive Bidder shall be allowed 15 minutes to make a detailed technical presentation to the evaluation committee. The presentation should be crisp and should precisely address following aspects concerning the Bidder:

- (a) Detailed methodology and technical work plan
- (b) Broad system architecture and design
- (c) Technology Contractors which the Bidder proposes to incorporate in the solution proposed to address the ToR requirements.
- (d) Certification(s), Affiliation(s), Authorised Partner(s) of OEM/Other leading technology providers/ System Integrators.
- (e) Ratings if any, achieved by international/national agencies in the field of IT/Communications/ Electronics / Networking

Note: Bidders are instructed to strictly adhere to the prescribed time limit for their presentation.

6.8.5. Selection and award criteria:

- a) IHMCL will award the Contract to the Bidder whose bid has been determined to be responsive as per criteria defined in Clause 6.8.3.1. above and secured minimum marks as defined in Clause 6.8.3.2. above, and who has offered the lowest price (L1).

In this RFP, the term “Lowest Bidder” shall mean the Bidder whose price is the lowest.

Generally, the Lowest Bidder shall be the Selected Bidder/ Successful Bidder (the “**Selected Bidder/ Successful Bidder**”). The L-2 Bidder shall be kept in reserve and may be invited to match the bid submitted by the Lowest Bidder, in case such Lowest Bidder withdraws or is not selected for any reason. In the event that L-2 Bidder does not match the bid of the Lowest Bidder, the Authority may, in its discretion, shall either invite fresh bids from the remaining Bidders or annul the Bidding Process.

- b) The Successful Bidder shall be intimated by IHMCL through Letter of Award (LOA). Upon issue of LOA the Successful Bidder shall be required to furnish Letter of Acceptance and Performance Security and other guarantees as prescribed in the RFP document. IHMCL shall have the right to get the bank guarantees verified from

the respective issuing bank. Upon receipt of verification, the Successful Bidder shall be invited to sign the contract with IHMCL. The format of Contract Agreement is prescribed in the RFP Document.

- c) IHMCL reserves the right to reject any bid which is non-responsive and no request for alteration, modification, substitution, or withdrawal shall be entertained by IHMCL in respect of such bids.

6.9. ABNORMALLY LOW BID

Further, in case where the bid of the successful firm is less than **85% of the average of all bids received**, the successful bidder shall have to submit an Additional Performance Security (APS) in the form of a Bank Guarantee for **5% (five percent)** of the contract amount. The other requirements of APS are same as those of Performance Security, IHMCL may also require the Bidder to produce detailed price analysis for any or all items of the Bill of Quantities, to demonstrate the internal consistency of the proposed System.

6.10. PERFORMANCE SECURITY

6.10.1 Upon issue of a Letter of Award (LOA) by IHMCL, the Successful Bidder shall be required to furnish an unconditional and irrevocable Performance Security in the form of a Performance Bank Guarantee (PBG) in the prescribed format within a period of 15 days. The PBG shall be for an amount of **5% (five percent) of its Total Bid Value** quoted in the financial bid and should be in favour of "Indian Highways Management Company Limited", New Delhi. The Performance Security shall be valid for a period of Six (6) years. In case the contract is extended, the Contractor shall extend the validity of PBG appropriately such that it remains valid until one year beyond completion of the contract.

6.10.2 The PBG from following banks shall only be accepted:

- a) State Bank of India or its subsidiaries.
- b) Any Indian Nationalised Bank.
- c) Any Scheduled Commercial Bank approved by RBI having a net worth of not less than 500 Crores as per the latest Annual Report of the Bank. In the case of a Foreign Bank (issued by the branch of India) the net worth in respect of the Indian operations shall only be taken into account.
- d) A Foreign Bank (issued by a branch outside India) with a counter guarantee from SBI or its subsidiaries or any Indian Nationalised Bank.

6.10.3 Deleted

6.10.4 In case of abnormally low Bid, the additional performance security shall be required to be submitted by the Successful Bidder as per clause 6.9, in addition to the 5% (five percent) PBG, to ensure that it shall perform the contractual obligations to the satisfaction of IHMCL despite such lower bid value and this additional performance security shall also be treated as performance security for encashment/ forfeiture.

6.11. MISCELLANEOUS

- 6.11.1 This RFP document also includes a format of the Contract Agreement to be executed with the Successful Bidder for providing stipulated services to IHMCL. Bidders are advised to study the RFP document along with its amendment/ addendum carefully. Submission of the bid will be deemed to have been done after careful study and examination of ground realities as well as all the instructions, eligibility norms, terms & conditions, requirements and specifications available in the RFP document with full understanding of its implications. The Bidder is expected to examine carefully all the instructions, conditions of Contract, forms for submitting Technical and Financial Bids and scope of work in the RFP document before submitting their Bids. Failure to comply with all the requirements of RFP document shall be at the Bidder's own risk. Bids, which are not substantially responsive to the requirements of the RFP document, shall be declared non-responsive and shall not be considered for evaluation.
- 6.11.2 No Bidder shall submit more than one bid against this RFP. If more than one bid is received from the same Bidder, all such bids shall be summarily rejected.
- 6.11.3 IHMCL will be at liberty to keep the credentials of the Bidders submitted by them at bidding stage, in public domain and the same may be uploaded by IHMCL on its web site. The Bidders shall have no objection if IHMCL uploads/ hosts the information pertaining to their credentials as well as of their key personnel.
- 6.11.4 The Bidding Process shall be governed by, and construed in accordance with, the laws of India and courts at New Delhi shall have exclusive jurisdiction over all disputes arising under, pursuant to and/or in connection with the Bidding Process.
- 6.11.5 Any dispute arising out of this procurement process shall be referred to Society for Affordable Redressal of Disputes (SAROD). The decision of the SAROD in this regard shall be final and binding on the parties.
- 6.11.6 IHMCL, in its sole discretion and without incurring any obligation or liability, reserves the right, at any time, to;
- i. Suspend and/or cancel the Bidding Process and/or amend and/or supplement the Bidding Process or modify the dates or other terms and conditions relating thereto;
 - ii. Consult with any Bidder in order to receive clarification or further information;
 - iii. Retain any information and/ or evidence submitted to IHMCL by, on behalf of, and/ or in relation to any Bidder; and/or;
 - iv. Independently verify, disqualify, reject and/ or accept any and all submissions or other information and/or evidence submitted by or on behalf of any Bidder.
- 6.11.7 IHMCL is not bound to reply/ respond to any representation/ letter or request for Change in Scope of work, eligibility criteria or any relaxation in respect of the tender conditions.
- 6.11.8 It shall be deemed that by submitting the Bid, the Bidder agrees and releases IHMCL, its employees, agents and advisers, irrevocably, unconditionally, fully and finally from any and all liability for claims, losses, damages, costs, expenses or liabilities in any way related to or arising from the exercise of any rights and/or performance of any obligations hereunder, pursuant hereto and/or in connection with the Bidding Process and waives, to the fullest extent permitted by Applicable Law, any and all rights and/ or claims it may have in this respect, whether actual or contingent, whether present or in future.

6.11.9 Verification and Dis-qualification: IHMCL reserves the right to verify all statements, information and documents submitted by the Bidder in response to this RFP and the Bidders shall, when so required by IHMCL, make available all such information, evidence and documents as may be necessary for such verification. Any such verification or lack of such verification, by IHMCL shall not relieve the Bidders of its obligations or liabilities hereunder nor will it affect any rights of IHMCL thereunder.

6.11.10 IHMCL reserves the right to reject any Bid and/ or declare it non-responsive, if:

- (i) At any time, a material misrepresentation is made or uncovered, or
- (ii) The Bidder does not provide, within the time specified by IHMCL, the supplemental information sought by IHMCL for evaluation of the Bid.

Such misrepresentation/ improper response shall lead to the disqualification of the Bidder. If such disqualification/ rejection occurs after the bids have been opened and the lowest Bidder gets dis-qualified/ rejected, then IHMCL reserves the right to take any such measure as may be deemed fit in the sole discretion of IHMCL including annulment of the Bidding Process.

6.12. Amendment to RFP Documents:

- a) Any modification in the RFP document shall be made by IHMCL separately through issue of an Addendum/ Amendment.
- b) At any time prior to the bid due date, IHMCL, may, for any reason, whether at its own initiative or in response to a clarification requested by a prospective Bidder, modify the conditions specified in the RFP document by an amendment. Any amendment/ addendum thus issued shall be part of the RFP document and shall be communicated by hosting the same on IHMCL's web site only and should be taken into consideration by the prospective Bidders while preparing their Bids.
- c) In order to give prospective Bidders reasonable time to take the amendment into account in preparing their bid, IHMCL may, at its discretion, extend the bid due date.
- d) The Bidder must read all the instructions in the RFP and abide by the same accordingly.

6.13. INDEMNITY

The Bidder shall, subject to the provisions of the Contract, indemnify IHMCL for any direct loss or damage caused on account of any act/ omission of the Bidder.

6.14. PROPRIETARY DATA

All documents and other information provided by IHMCL or submitted by a Bidder to IHMCL shall remain or become the property of IHMCL. Bidders are to treat all information as strictly confidential. IHMCL will not return any bid or any information related thereto. All information collected, analysed, processed or in whatever manner provided by the Successful Bidder to IHMCL in relation to the services shall be the property of IHMCL.

The Bidder shall not keep any copy of the data/ video with them without prior permission of the IHMCL. The Bidder shall not use any data / video for any purpose other than that permitted by IHMCL.

Adequate cyber security measures shall be taken to protect the entire system and data from cyber-attacks and data theft.

6.15. CORRUPT OR FRAUDULENT PRACTICES


IHMCL requires Bidder observe the highest standard of ethics during the procurement and execution of the Contract. In pursuance of this policy IHMCL, defines, for the purposes of this provision, the terms set forth below as follows:

- a) "Corrupt Practice" means the offering, giving, receiving or soliciting of anything of value to influence the action of a public official in the procurement process or in Contract execution;
- b) "Fraudulent Practice" means a misrepresentation of facts in order to influence a procurement process or the execution of a Contract to the detriment of IHMCL, and includes collusive practice among Bidders (prior to or after Bid submission) designed to establish Bid prices at artificial non-competitive levels and to deprive IHMCL of the benefits of free and open competition;
- c) "Coercive Practice" means impairing or harming, or threatening to impair or harm, directly or indirectly, any person or property to influence any person's participation or action in the Bidding Process;
- d) "Undesirable Practice" means (i) Establishing contact with any person connected with or employed or engaged by IHMCL with the objective of canvassing, lobbying or in any manner influencing or attempting to influence the Bidding Process; or (ii) having a Conflict of Interest; and
- e) "Restrictive Practice" means forming a cartel or arriving at any understanding or arrangement among Bidders with the objective of restricting or manipulating a full and fair competition in the Bidding Process.
- f) will reject a bid if it determines that the Bidder has engaged in corrupt or fraudulent or coercive or undesirable or restrictive practices in competing for the Contract in question;
- g) will blacklist/ declare a Bidder ineligible, either indefinitely or for a stated period of time, to be awarded any Contract by IHMCL if it at any time determines that the Bidder has engaged in corrupt or fraudulent or coercive or undesirable or restrictive practices in competing for, or in executing, a IHMCL Contract.

6.16. Integrity Pact:

Bidder shall comply with the provisions of the Office Memorandum No. 13030/09/2008- Vig. Dated 28.01.2013 issued by NHAI (Copy enclosed) at Appendix-I.

6.16.1. Appendix-I

 भारतीय राष्ट्रीय राजमार्ग प्राधिकरण
(सड़क परिवहन और राजमार्ग मंत्रालय)
National Highways Authority of India
(Ministry of Road Transport and Highways)
पी-5 एवं 6, सेक्टर-10, द्वारका, नई दिल्ली-110075
G-5 & 6, Sector-10, Dwarka, New Delhi-110075

दस्तावेज/प्रोजेक्ट: 91-11-25074/100750-4200
फैक्स: 91-11-25083507 / 25083514

No.1303G/G9/2008-Vig. Dated: 28th January, 2013

Office Memorandum

Sub: Adoption of Integrity Pact (IP) for NHAI Projects-reg.

In suppression of OM No. NHAI/CMC/IP/IEM/2011-12 dated 13.08.2012 and OM of NHAI/CMC/IP/IEM/2011-12 dated 14.08.2012, it has been decided to implement the concept of Integrity Pact in NHAI projects. The Integrity Pact (IP) envisages an agreement between the prospective bidder and the buyers committing the persons/officials of both the parties, not to exercise any corrupt influence on any aspect of the contract. The IP also envisages empanelment of Independent External Monitors (IEM). The IEM may review independently and objectively whether and to what extent parties have complied with their obligations under the pact.

2. NHAI is going to appoint IEM shortly for implementation of the IP in NHAI. MoRT&H vide its letter no: C-13019/8/2009-Vig. dated 18.11.2011 has approved applicability of adoption of IP in NHAI works as mentioned below:

- (i) Civil Works above Rs.100.00 crore
- (ii) Services such as consultancy, engineering etc. above Rs.5.00 crore

3. In this connection, all the officers of NHAI are hereby requested to implement and follow the concept of IP and adopt the same in all future projects of NHAI as scrupulously in works included in para.2 above as per Model Agreements (copy enclosed) for each category. This Model Agreement would be provided to the bidders at NIT/ Pre-bid /Technical bid stage, whichever applicable, with instruction to submit the same after signing it. Contractor/ concessionaire / consultant / bidder would be required to submit this duly signed agreement (signed by the same signatory competent/authorized to sign the relevant contract agreement) along with their Technical Bid/Tender Documents. The representative authorized to sign contract agreement, on behalf of NHAI, would sign the same while signing the contract so that this may be made a part of the contract document and binding for both the parties signing the contract.

4. It is clarified that IP should cover all phases of the contract, i.e. from the stage of Notice Inviting Tender (NIT) / pre-bid stage till the conclusion of the contract, i.e. the final payment or the duration of warranty / guarantee / defect liability / concession period, whichever applicable. The IEM would be, invariably, cited in the NIT. Further, information relating to tender in progress and under finalization would need to be shared with IEM on monthly basis.


contd.2.

5. After implementation of Integrity Pact, NHAI has to send progress/status in the implementation of IP enabling CVC to include the same in their annual report as prescribed in the CVC circular no. 10/5/09 dated 18.05.2009 and subsequent circular no.31/08/10 dated 13.08.2010 (copies enclosed). Further, an internal assessment of the impact of IP shall be carried out periodically by the CVO and reported to the CVC through their report or special report, wherever necessary. In view of this, status of implementation of IP would be reported by all divisions to CVO on monthly basis.

6. All the Divisions engaged in purchase/procurement shall ensure strict compliance of this.

This issues with the approval of Chairman, NHAI.

- Encl: (1) Model Agreement for category (i) works
(2) Model Agreement for category (ii) works
(3) CVC's Circular no. 10/5/09 dt. 18.05.09
(4) CVC's Circular no.31/08/10 dt.13.08.10


(B.N.Sahay)
General Manager (CMC)

To

1. All PIUs/CMUs
2. All ROs
3. All CGMs at HQ
4. All GMs at HQ
5. CVO, NHAI

Copy for information to:

1. PS to Chairman
2. All PS to Members

6.16.2. INTEGRITY PACT FORMAT

(To be executed on plain paper and submitted along with Technical Bid. To be signed by the Bidder and same signatory competent/ authorized to sign the relevant contract on behalf of IHMCL)

RFP No.: IHMCL/ATMS/Zone-Delhi Region/2026/01, dated 20 May 2026

This Integrity Pact is made at on this day of 2025 Between

Indian Highways Management Company Limited (IHMCL), incorporated under Companies Act 1956, having its office at G-5 & 6, Sector – 10, Dwarka, New Delhi, hereinafter referred to as “**The Principal**”, which expressions shall unless repugnant to the meaning or contract thereof include its successors and permitted assigns.

And

_____, hereinafter referred to as “**The Bidder/ ATMS Contractor/ Contractor**” and which expression shall unless repugnant to be meaning or context thereof include its successors and permitted assigns.

Preamble

Whereas, the Principal intends to award, under laid down organizational procedures contract/s for

..... The Principal values full Compliance with all relevant laws of the land, rules of land, regulations, economic use of resources and of fairness/ transparency in its relations with its Bidder(s)/ Contractor(s)/ Contractor(s).

And whereas to meet the purpose aforesaid, both the parties have agreed to enter into this Integrity Pact (hereafter referred to as Integrity Pact) the terms and conditions of which shall also be read as integral part and parcel of the Tender documents and contract between the parties. Now, therefore, in consideration of mutual covenants stipulated in this pact, the parties hereby agree as follows and this pact witnessed as under:

Article 1- Commitments of the Principal

The Principal commits itself to take all measures necessary to prevent corruption and to observe the following principles:

No employee of the Principal, personally or through family members, will in connection with the tender for or the execution of a contract, demand, take a promise for or accept for self or third person any material or immaterial benefit which the person is not legally entitled to.

The Principal will during the tender process treat all Bidder(s) with equity and reason. The Principal will in particular before and during the tender process provide to all Bidder(s) the same information and will not provide to any Bidder(s) confidential/ additional information through which the Bidder(s) could obtain an advantage in relation to the tender process or the contract execution.

The Principal will exclude all known prejudiced persons from the process, whose conduct in

the past has been of biased nature.

If the Principal obtains information on the conduct of any of its employees which is a criminal offence under the IPC/PC Act or any other Statutory Acts or if there be a substantive suspicion in this regard, the Principal will inform the Chief Vigilance Officer and in addition can initiate disciplinary actions as per its internal laid down Rules/ Regulations.

Article 2- Commitments of the Bidder(s)/ Contractor(s)/ Contractor(s)

The Bidder(s)/ Contractor(s)/ Contractor(s) commit himself to take all measures necessary to prevent corruption. He commits himself to observe the following principles during his participation in the tender process and during the contract execution.

The Bidder(s)/ Contractor(s)/ Contractor(s) will not, directly or through any other person or firm, offer, promise or give to any of the Principal's employees involved in the tender process or the execution of the contract or to any third person any material or other benefit which he/she is not legally entitled to, in order to obtain in exchange any advantage of any kind whatsoever during the tender process or during the execution of the contract.

The Bidder(s)/ Contractor(s)/ Contractor(s) will not enter with other Bidders into any undisclosed agreement or understanding, whether formal or informal. This applies in particular to prices, specifications, certifications, subsidiary contracts, submission or non-submission or bids or any other actions to restrict competitiveness or to introduce cartelization in the Bidding Process.

The Bidder(s)/ Contractor(s)/ Contractor(s) will not commit any offence under the relevant IPC/ PC Act and other Statutory Acts; further the Bidder(s)/ Contractor(s)/ Contractor(s) will not use improperly, for purposes of completion or personal gain, or pass on to others, any information or document provided by the Principal as part of the business relationship, regarding plans, technical proposals and business details, including information contained or transmitted electronically.

The Bidder(s)/ Contractor(s)/ Contractor(s) of foreign origin shall disclose the name and address of the Agents/ representatives in India, if any. Similarly, the Bidder(s)/ Contractor(s)/ Contractor(s) of Indian Nationality shall furnish the name and address of the foreign principle, if any.

The Bidder(s)/ Contractor(s)/ Contractor(s) will, when presenting his bid, disclose any and all payments he has made, is committed to or intends to make to agents, brokers or any other intermediaries in connection with the award of the contract. He shall also disclose the details of services agreed upon for such payments.

The Bidder(s)/ Contractor(s)/ Contractor(s) will not instigate third persons to commit offences outlined above or be an accessory to such offences.

The Bidder(s)/ Contractor(s)/ Contractor(s) will not bring any outside influence through any Govt. bodies/ quarters directly or indirectly on the Bidding Process in furtherance of his bid.

Article 3- Disqualification from tender process and exclusion from future contracts

If the Bidder(s)/ Contractor(s)/ Contractor(s) before award or during execution has committed a transgression through a violation of any provision of Article-2, above or in any other form such as to put his reliability or credibility in question, the Principal is entitled to disqualify the Bidder(s)/ Contractor(s)/ Contractor(s) from the tender process.

If the Bidder(s)/ Contractor(s)/ Contractor(s) have committed a transgression through a violation of Article-2 such as to put his reliability or credibility into question, the Principal shall be entitled to exclude including blacklist and put on holiday the Bidder(s)/ Contractor(s)/ Contractor(s) for any future tender/ contract award process. The imposition and duration of the exclusion will be determined by the severity of the transgression. The severity will be determined by the Principal taking into consideration the full facts and circumstances of each case particularly taking into account the number of transgressions, the position of the transgressors within the company hierarchy of the Bidder(s)/ Contractor(s)/ Contractor(s) and the amount of the damage. The exclusion will be imposed for a minimum of 1 year.

A transgression is considered to have occurred if the Principal after due consideration of the available evidence concludes that "On the basis of facts available there are no material doubts".

The Bidder(s)/ Contractor(s)/ Contractor(s) with its free consent and without any influence agrees and undertakes to respect and uphold the Principal's absolute rights to resort to and impose such exclusion and further accepts and undertakes not to challenge or question such exclusion on any ground, including the lack of any hearing before the decision to resort to such exclusion is taken. This undertaking is given freely and after obtaining independent legal advice.

The decision of the Principal to the effect that a breach of the provisions of this Integrity Pact has been committed by the Bidder/ Contractor/ Contractor shall be final and binding on the Bidder/ Contractor/ Contractor.

On concurrence of any sanctions/ disqualification etc. arising out from violation of integrity pact the Bidder/ Contractor/ Contractor shall not be entitled for any compensation on this account.

Subject to full satisfaction of the Principal, the exclusion of the Bidder/ Contractor/ Contractor could be revoked by the Principal if the Bidder/ Contractor/ Contractor can prove that he has restored/ recouped the damage caused by him and has installed a suitable corruption prevention system in his organization.

Article 4- Compensation for Damages

If the Principal has disqualified the Bidder(s) from the tender process prior to the award according to Article 3, the Principal shall be entitled to invoke the Bid Securing Declaration apart from any other legal right that may have accrued to the Principal.

In addition to 1 above, the Principal shall be entitled to take recourse to the relevant provisions of the contract related to Termination of Contract due to Contractor/ Contractor's Default. In such case, the Principal shall be entitled to forfeit the Performance Bank Guarantee of the Contractor/ Contractor and/or demand and recover liquidated and all damages as per the provisions of the Contract Agreement against Termination.

Article 5 - Previous Transgressions

The Bidder declares that no previous transgressions occurred in the last 3 years immediately before signing of this Integrity Pact with any other Company in any country conforming to the anti-corruption/ Transparency International (TI) approach or with any other Public Sector Enterprise/ Undertaking in India or any Government Department in India that could justify his exclusion from the tender process.

If the Bidder makes incorrect statement on this subject, he can be disqualified from the tender process or action for his exclusion can be taken as mentioned under Article-3 above for transgressions of Article-2 and shall be liable for compensation for damages as per Article-4

above.

Article 6 -Equal treatment of all Bidder(s)/Contractor(s)/Contractor(s)/ Subcontractor(s)

The Bidder(s)/ Contractor(s)/ Contractor(s) undertake(s) to demand from all sub-contractor(s) a commitment in conformity with this Integrity Pact, and to submit it to the Principal before contract signing.

The Principal will enter into agreements with identical conditions as this one with all Bidder(s)/ Contractor(s)/ Contractor(s) and Subcontractor(s).

The Principal will disqualify from the tender process all Bidders who do not sign this Pact or violate its provisions.

Article 7 - Criminal charges against violating Bidder(s)/ Contractor(s)/ Contractor(s)/ Sub-contractor(s)

If the Principal obtains knowledge of conduct of a Bidder/ Contractor/ Contractor or Subcontractor, or of an employee or a representative or an associate of a Bidder/ Contractor/ Contractor or Subcontractor, which constitutes corruption, or if the Principal has substantive suspicion in this regard, the Principal will inform the same to the Chief Vigilance Officer.

Article 8 - Pact Duration

This Pact begins when both parties have legally signed it. It expires for the Contractor 12 months after Operation & Maintenance Period is over or 12 months after his last payment under the contract whichever is later and for all other *unsuccessful* Bidders 6 months after the Contract has been awarded.

If any claim is made/ lodged during this time, the same shall be binding and continue to be valid despite the lapse of this pact as specified above, unless it is discharged/ determined by Chairman & Managing Director of IHMCL.

Article 9 - Other Provisions

This Pact is subject to Indian Law Place of performance and jurisdiction is the Registered Office of the Principal i.e. New Delhi.

Changes and supplements as well as termination notices need to be made in writing.

If the Bidder/ Contractor/ Contractor is a partnership or a consortium, this pact must be signed by all partners or consortium members.

Should one or several provisions of this Agreement turn out to be invalid, the remainder of this Agreement remains valid. In this case, the parties will strive to come to an agreement to their original intentions.

Any disputes/ differences arising between the parties with regard to term of this Pact, any action taken by the Principal in accordance with this Pact or any relation thereof shall not be subject to any Arbitration.

The actions stipulated in this Integrity Pact are without prejudice to any other legal action that may follow in accordance with the provisions of the extant law in force relating to any civil or criminal proceedings.

In witness whereof the parties have signed and executed this Pact at the place and date first donementioned in the presence of following witnesses:

RFP for Design, Supply, Installation, Testing, Commissioning and Operation & Maintenance ATMS projects
in Zone-1 Delhi Region on EPC mode

[For & On behalf of the (Principal)] [For & On behalf of the Bidder/ Contractor/
Concessionaire/ Consultant]
(Office Seal)

Place:..

Date: _

Witness 1:

(Name & Address)

Witness 2:

(Name & Address)

6.17. Sub-Contracting

Sub-contracting shall not be permitted under this Contract, except for the following activities and only with the prior written approval of IHMCL:

- a. Optical Fiber Cable (OFC) works to be carried out exclusively by licensed IP-I companies registered with the Department of Telecommunications (DoT);
- b. Civil and interior works;
- c. Day-to-day operations-related activities during the Operations & Maintenance (O&M) phase;
- d. Facility management services during the O&M phase.

Notwithstanding the above, the ATMS Contractor shall remain solely responsible for the due performance of the Contract, including all work executed by its approved sub-contractors. Any delay, deficiency, error, or non-compliance by a sub-contractor shall be deemed a default by the ATMS Contractor.

Any sub-contracting or outsourcing undertaken without the prior written approval of IHMCL shall constitute an unauthorized sub-contracting and shall be treated as a breach of the Contract in accordance with Clause No. 1.2.29 (e).

7. PART-II FORMAT FOR BID SUBMISSION

7.1. Form T-1: Technical Bid Covering Letter

(To be prepared on letterhead of the Bidder, scanned & uploaded on E-tender portal)

To,

Chief Operating Officer
Indian Highways Management Company Limited
G 5&6, Sector-10, Dwarka,
New Delhi – 110075

Sub.: Request For Proposal (RFP) for Design, Supply, Installation, Testing, Commissioning and Operation & Maintenance of Advanced Traffic Management System (ATMS) projects in Zone-1 (Delhi Region) on EPC mode

Ref: RFP No.: IHMCL/ATMS/Zone-Delhi Region/2026/01, dated 20 May 2026

Dear Sir,

1. I/We, the undersigned, have carefully examined the contents of the above referred RFP document including amendments/ addendums (if any) thereof and we undertake to fully comply and abide by the terms and conditions specified therein and hereby submit our Bid for the aforesaid service. Our bid for the subject RFP is unconditional and unqualified.
2. I/We offer to execute the work in accordance with the Scope of work and the Conditions of Contract of this RFP both explicit and implied.
3. I/We undertake that, in competing for (and, if the award is made to us), for executing the above contract, we will strictly observe the laws against fraud and corruption in force in India namely "Prevention of Corruption Act 1988".
4. I/We understand that:
 - a. This bid, if found incomplete in any respect and/ or if found with conditional compliance or not accompanied with the requisite Bid Securing Declaration, shall be summarily rejected.
 - b. If at any time, any averments made or information furnished as part of this bid is found incorrect, then the bid will be rejected and the contract if awarded on the basis of such information shall be cancelled.
 - c. IHMCL is not bound to accept any/ all Bid(s) it will receive.
 - d. Until a contract is executed, this bid together with RFP Document as well as notification of Letter of Award issued by IHMCL shall constitute a binding Contract between us.
5. I/We declare that:
 - a. I/we have no proceeding for insolvency/bankruptcy in NCLT / Court as on Bid Due Date
 - b. I/We have not been blacklisted/ *declared ineligible* by IHMCL or National Highways Authority of India (NHAI) or Ministry of Road Transport & Highways, Government of

- India or any other agency as on Bid Due date. I/We also confirm that I/We have not been *declared as non-performing or debarred* by IHMCL or NHAI or Ministry of Road Transport & Highways, Government of India as on Bid Due Date.
- c. I/We *haven't been blacklisted* by a Central/ State Government Institution/ Public Sector Undertaking/ Autonomous body and there has been *no litigation* with any Government Department/ PSU/ Autonomous body on account of similar services as on Bid Due Date.
- d. I/We have not directly or indirectly or through an agent engaged or indulged in any corrupt practice, fraudulent practice, coercive practice, undesirable practice or restrictive practice, as defined in the Contract Agreement, in respect of any tender or request for proposal issued by or any Contract entered into with IHMCL or any other public sector enterprise or any government, Central or State; and I/We hereby certify that we have taken steps to ensure that in conformity with the provisions of the RFP document, no person acting for us or on our behalf has engaged or will engage in any corrupt practice, fraudulent practice, coercive practice, undesirable practice or restrictive practice.
6. I/We undertake that we have deployed our own proprietary ATMS integrated software which is integrated with the subsystems and the same is in operation since last one year from bid due date. All IPR, source code etc. of the ATMS software are owned by the Sole Bidder / either member of Consortium, Documentary evidence shall be submitted along with the bid confirming the ownership and the operational period of more than one year. For operational period confirmation, a certificate from authorized signatory of their client (IHMCL or any other Govt. Authority) may be submitted with a brief write-up on their ATMS application with screenshots of module like TMCS, VIDS, VSDS, VMS, etc.
7. I/We have not directly or indirectly or through an agent engaged or indulged in any corrupt practice, fraudulent practice, coercive practice, undesirable practice or restrictive practice, as defined in the Contract Agreement, in respect of any
8. In the event of my / our bid being declared as successful bid, I/we agree to enter into a Contract Agreement in accordance with the format of the Contract Agreement. I/We agree not to seek any change in the aforesaid format of the Contract Agreement and agree to abide by the same.
9. I/We certify that:
- a. I/We have not been convicted by a Court of Law or indicted or adverse orders passed by a regulatory authority which could cast a doubt on our ability to undertake the subject work or which relates to a grave offence that outrages the moral sense of the community.
- b. Neither the Bidder nor any of its Directors are the subject of criminal or civil proceedings that could be expected to adversely affect its business or its ability to bid in the present tender.
- c. No investigation by a regulatory authority is pending either against us or against our CEO or any of our directors/ managers/ employees.
- d. I / We don't have any conflict of interest in terms of Clause 4.3 of eligibility criteria defined in this RFP document.
- e. The information provided in this technical bid (including the attachments) as well as the financial bid is true, accurate and complete to the best of my knowledge and belief. Nothing has been omitted which renders such information misleading; and all documents accompanying my/our bid are true copies of their respective originals. I/We

shall be liable for disqualification or termination of contract at any stage, if any information/ declaration is found to be incorrect or false. I/We will intimate IHMCL promptly in case of any change in the information submitted as part of this technical bid.

- f. I/We offer the cost of the RFP document and bid Security in accordance with the RFP document as per the details furnished below:

	Reference No.	Date	Amount (Rs.)	Issuing Bank/Branch
Tender Fee				
Bid Security				

10. The documents in original accompanying the bid document have been submitted in a separate envelope as envisaged in the RFP document and marked appropriately.
11. I am the Director / Authorized Signatory of the aforesaid company / firm and I am authorized to sign this bid on behalf of the firm / company. I submit this bid after carefully reading all the terms and conditions contained in the RFP document and its addendum/ amendment, if any, and undertake to abide by the same. It is also certified that the bid is being submitted in the prescribed formats without any addition / deviation / alteration and our bid is unconditional.
12. We hereby undertake that, in the event of award of the Contract, any foreign Consortium member shall obtain and furnish valid Goods and Services Tax (GST) registration in India within thirty (30) days from the date of signing of the Contract Agreement, in compliance with applicable laws.
13. We hereby undertake that, in the event of award of the Contract, any foreign Consortium member shall obtain Security Clearance from the Competent Authority in India within ninety (90) days from the date of signing of the Contract Agreement, in compliance with applicable laws.

We remain, Yours sincerely,

Name

Designation/ Title of the Authorized Signatory.....

7.2. Form T-2: Brief Information about the Bidder(s)

(To be prepared on letterhead of the Bidder, scanned & uploaded on E-tender portal)

Sub.: Request For Proposal (RFP) for Design, Supply, Installation, Testing, Commissioning and Operation & Maintenance of Advanced Traffic Management System (ATMS) projects in Zone-1 (Delhi Region) on EPC mode

Ref: RFP No.: IHMCL/ATMS/Zone-Delhi Region/2026/01, dated 20 May 2026

1) Details of Lead Bidder:

- a) Name of Bidder:
- b) Year of establishment:
- c) Constitution of the Bidder entity e.g. Government enterprise, private limited company, limited company, proprietorship / partnership firm etc.
- d) In case of a government enterprise, please indicate as to whether legally and financially autonomous and operate under commercial law.
- e) Name(s) of Directors/ Proprietors/ Partners Yes/ No/ Not applicable
.....
.....
.....

2) Details of Consortium Partner:

- a) Name of Bidder:
- b) Year of establishment:
- c) Constitution of the Bidder entity e.g. Government enterprise, private limited company, limited company, proprietorship / partnership firm etc.
- d) In case of a government enterprise, please indicate as to whether legally and financially autonomous and operate under commercial law.
- e) Name(s) of Directors/ Proprietors/ Partners Yes/ No/ Not applicable
.....
.....
.....

3) Address for correspondence with Telephone/ Fax numbers/ e-mail address:

- (a) Complete postal address:
- (b) Fixed telephone number
- (c) Mobile telephone number

(d) E-mail address

4) Name & Address of the principal banker:

- a) Bank A/c Number
- b) Branch Address
- c) IFSC /MICR Code:

4. Name of the Statutory Auditor/ Company Secretary/ Chartered Accountant certifying the documents along with his/ her Membership number, if applicable:

Name

Designation of the Authorized Signatory

Note: In case of JV/ Consortium, the aforesaid information shall be required for each member of the JV/ Consortium separately.

7.3. Form T-3: Power of Attorney

(To be executed on non-judicial Stamp Paper of appropriate denomination)

Know all men by these presents, we, (name of Company and address of the registered

office) do hereby constitute, nominate, appoint and authorize Mr / Ms. son/daughter/wife

of..... and presently residing at , who is presently employed with us and holding the position of as our true and lawful attorney (hereinafter referred to as the "Authorized Signatory or Attorney") 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 Bid for selection as the Contractor for "Request For Proposal (RFP) for Design, Supply, Installation, Testing, Commissioning and Operation & Maintenance of Advanced Traffic Management System (ATMS) projects in Zone-1 (Delhi Region) on EPC mode" proposed by Indian Highways Management Company Limited, including but not limited to signing and submission of all applications, bid(s) and other documents and writings, and providing information/ responses to IHMCL, representing us in all matters before IHMCL, signing and execution of all contracts and undertakings consequent to acceptance of our bid and generally dealing with IHMCL in all matters in connection with or relating to or arising out of our Bid for the said Tender and/or upon award thereof to us.

AND, we do hereby agree to ratify and confirm all acts, deeds and things lawfully done or caused to be done by our said Authorised Signatory or 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 Authorised Representative/ Attorney in exercise of the powers hereby conferred shall and shall always be deemed to have been done by us.

IN WITNESS WHEREOF WE, THE ABOVE NAMED PRINCIPAL HAVE EXECUTED THIS POWER OF ATTORNEY ON THIS DAY OF , 2026

For

(Signature, name, designation and address)

Witnesses:

1.

2.

Notarised

Accepted

.....

(Signature, name, designation and address of the Attorney)

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 executants(s) and when it is so required the same should be under common 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 other 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.
- For a Power of Attorney executed and issued overseas, the document will also have to be legalised by the Indian Embassy and notarised in the jurisdiction where the Power of Attorney is being issued. However, Bidders from countries that have signed the Hague Legislation Convention 1961 need not get their Power of Attorney legalised by the Indian Embassy if it carries a conforming Apostles certificate.

7.4. Form T-4: Power of Attorney for Lead Member of JV/ Consortium

(To be executed on non-judicial Stamp Paper of appropriate denomination)

Whereas the Indian Highways Management Company Limited (“**Authority**”) has invited bids from interested parties for Request For Proposal (RFP) for Design, Supply, Installation, Testing, Commissioning and Operation & Maintenance of Advanced Traffic Management System (ATMS) projects in Zone-1 (Delhi Region) on EPC mode (“the **Project**”).

Whereas,, and (collectively the “JV/ Consortium”) being Members of the JV/ Consortium 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/ Consortium to designate one of them as the Lead Member with all necessary power and authority to do for and on behalf of the JV/ Consortium, all acts, deeds and things as may be necessary in connection with the JV/ Consortium’s 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, 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/ Consortium, as the Lead Member and true and lawful attorney of the JV/ Consortium (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/ Consortium and any one of us during the Bidding Process and, in the event the JV/ Consortium 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/ Consortium, 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/ Consortium and generally to represent the JV/ Consortium in all its dealings with the Authority, and/ or any other Government Agency or any person, in all matters in connection with or relating to or arising out of the JV/ Consortium’s bid for the Project and/ or upon award thereof till the Contract is entered into with the Authority 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/ Consortium.

IN WITNESS WHEREOF WE THE PRINCIPALS ABOVE NAMED HAVE EXECUTED THIS POWER OF

ATTORNEY ON THIS DAY OF 20.....

For

(Signature, Name & Title)

For

(Signature, Name & Title)

For

(Signature, Name & Title)

Witnesses:1.

2.

(Executants)

(To be executed by all the Members of the Consortium)

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 common 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.
- For a Power of Attorney executed and issued overseas, the document will also have to be legalised by the Indian Embassy and notarised in the jurisdiction where the Power of Attorney is being issued. However, Bidders from countries that have signed the Hague Legislation Convention 1961 need not get their Power of Attorney legalised by the Indian Embassy if it carries a conforming Apostles certificate.

7.5. Form T-5: Joint Bidding Agreement for JV/ Consortium

(To be executed on non-judicial Stamp Paper of appropriate denomination)

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)

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

- (A) THE INDIAN HIGHWAYS MANAGEMENT COMPANY LIMITED, incorporated under Companies Act 1956, and having its principal offices at G-5 & 6, Sector 10, Dwarka, New Delhi-110075 (hereinafter referred to as the **"Authority"** 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 "Request For Proposal (RFP) for Design, Supply, Installation, Testing, Commissioning and Operation & Maintenance of Advanced Traffic Management System (ATMS) projects in Zone-1 (Delhi Region) on EPC mode" (the **"Project"**).
- (B) The Parties are interested in jointly bidding for the Project as members of a JV/ Consortium 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/ Consortium shall 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. Consortium

- 2.1 The Parties do hereby irrevocably constitute a JV/ consortium (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/ Consortium and not individually and/ or through any other JV/Consortium 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 Contractor 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 Consortium and shall have the power of attorney from all Parties for conducting all business for and on behalf of the Consortium 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 Consortium;}

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/ Consortium

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

Second 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/ Consortium 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 fulfillment 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/ Consortium. However, in case during the execution of the contract it substantiated that the JV/ Consortium is not actually qualified for the Project and submitted false information, the Agreement will stand terminated and damages as deemed fit by the Authority shall be levied on the contactors.

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 Authority.

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

SIGNED, SEALED AND DELIVERED	SIGNED, SEALED AND DELIVERED
For and on behalf	

LEAD MEMBER by:	SECOND PART
(Signature)(Name)	(Signature) (Name)
(Designation)	(Designation)
(Address)	(Address)

SIGNED, SEALED AND DELIVERED
For and on behalf of THIRD PART

In the presence of:	(Signature) (Name) (Designation)
	(Address)
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 common seal affixed in accordance with the required procedure. ***The Joint Bidding Agreement should be executed on a non-judicial stamp paper of appropriate denomination and should be duly notarised by a notary public.***
2. 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 Consortium Members.
3. For a Joint Bidding Agreement executed and issued overseas, the document will also have to be legalised by the Indian Embassy and notarised in the jurisdiction where the Joint bidding Agreement is being issued. However, Bidders from countries that have signed the Hague Legislation Convention 1961 need not get their Joint Bidding Agreement legalised by the Indian Embassy if it carries a conforming Apostles certificate.

7.6. Form T-6: Format of submission of Work Experience / Technical Strength of Bidder

Sub.: Request For Proposal (RFP) for Design, Supply, Installation, Testing, Commissioning and Operation & Maintenance of Advanced Traffic Management System (ATMS) projects in Zone-1 (Delhi Region) on EPC mode

Ref: RFP No.: IHMCL/ATMS/Zone-Delhi Region/2026/01, Dated 20 May 2026 on above subject.

Client Details Client Name: Address: Name of Contact Person: Contact No.Contact E-mail ID. (official e-mail ID)		Name of Work / Project ⁴
		Location:
		Approximate Value of Work / Project (Rs.)
Start Date		Present Status of Project (as per the Biddersmandate)
Completion Date		
Present Status		
Length of Project where ATMS solution is implemented (in Km) OR, ICT components, as applicable		
Application Users		
Name of Persons Deployed (Key Persons only)		
Detailed features of Project Executed:		

Name

Designation/ Title of the Authorized Signatory.....

Dated: / /2026

Note: Bidder should submit relevant details of each projects in this format and should enclose:

- i) Go-live / acceptance / completion Certificate issued by the customer; and
 - ii) Work Order / Purchase order / Copy of contract / Letter of Award highlighting detailed scope of project implemented within the last 5 financial years prior to the Bid due date as proof for the same.
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7.7. Form T-7 Undertaking for OEM

To,
Chief Operating Officer
Indian Highways Management Company Limited
G 5&6, Sector-10, Dwarka,
New Delhi – 110075

Subject: Request For Proposal (RFP) for Design, Supply, Installation, Testing, Commissioning and Operation & Maintenance of Advanced Traffic Management System (ATMS) projects in Zone-1 (Delhi Region) on EPC mode

Ref: RFP No.: IHMCL/ATMS/Zone-Delhi Region/2026/01 , dated 20 May 2026 on above subject.

I/we undertake the following:

- 1) That the OEM(s) for each product or technology quoted has been engaged in the business of that product, solution or technology for a period of not less than three (3) years as on the date of release of the RFP, and maintains its own service and support offices to ensure smooth after sales service support on site.
- 2) That I/we fully comply with the Office Memorandum no. F. No. NH-35014/20/2020-H, Government of India, Ministry of Road Transport & Highways dated 04.08.2020, regarding Department of Expenditure (DoE), Ministry of Finance, Govt. of India O.M. No. 6/18/2019-PPD dated 23.07.2020, vide which Rule 144 of the general Financial Rules 2017 entitled "Fundamental principles of public buying" has been amended by inserting sub-rule 144 (xi) in the General Financial Rules (GFRs), 2017 which states that:
- 3) "Any Bidder from a country which shares a land border with India will **be** eligible to bid in any procurement whether of goods, services (including consultancy services and non-consultancy services) or works (including turnkey projects) only if the Bidder is registered with the Competent Authority." This condition shall also be applicable on sub-contracting of any works / goods / services, etc. The Bidder shall furnish the registration status of the sub-contractor/ supplier with Competent Authority (for the items / goods proposed to be procured from any country which shares a land border with India).
- 4) That the OEM(s) should not be rebranding & reselling products in India through importing/ trading from a country that shares a Land Border with India.
- 5) That the source code of the Software and Firmware being supplied for all the relevant equipment being supplied against this bid does not reside in any Country that shared a Land Border with India
- 6) That the OEM(s) for all active components will give a declaration that products or technology quoted are neither end-of- sale nor end-of-life as on the date of installation and commissioning and are not end-of-support till the successful completion of O&M period of the project.
- 7) That the proposed OEM is not blacklisted by any State / Central Government Department or Central /State PSUs as on bid submission date.
- 8) That each of the proposed OEM(s) has existing capability and infrastructure to provide 24x7x365 technical support in India.

- 9) Adequate supporting documents pertaining to the above points, along with a summary compliance table, should be submitted in the technical proposal (Form T-9) by the Bidder.

(Signature of the Power of Attorney Holder)

7.8. Form T-8 Format of Certificate in respect of Bidder's Average Annual Turnover and Net Worth

CERTIFICATE (To be given by a Statutory Auditor)

Sub.: Request For Proposal (RFP) for Design, Supply, Installation, Testing, Commissioning and Operation & Maintenance of Advanced Traffic Management System (ATMS) projects in Zone-1 (Delhi Region) on EPC mode

Ref: RFP No.: IHMCL/ATMS/Zone-Delhi Region/2026/01, dated 20 May 2026 on above subject

Certificate of Annual Turnover and Net Worth

It is certified that we have examined the audited books of accounts of M/s. _____ (*name and address of the Bidder*) and the details of the annual turnover during the last three financial years and net worth as on 31.03.2025 are as under:

- a) **Annual Turnover** from Information Technology / Communication Technology / System Integration Business

Amount in Rs. FY 2022-23, 2023-24, 2024-25

Financial Year	Amount in figures
FY 2022-23	A1
FY 2023-24	A2
FY 2024-25	A3
Average Annual Turnover	$=(A1+A2+A3)/3$

B) Net Worth *Amount in Rs.*

As on	Amount in figures	Amount in words
31.03.2025		

The break-up of above mentioned Net worth is mentioned below:

S No.	Particulars	Amount as on 31.03.2025 (Rs. in Crore)
1.	Aggregate value of the paid-up share capital	XXX
2.	Add: all reserves created out of the profits	XXX
3.	Add: securities premium account	XXX
4.	Less: aggregate value of the accumulated losses	XXX
5.	Less: deferred expenditure not written off	XXX
6.	Less: miscellaneous expenditure not written off	XXX
	NET WORTH (1+2+3-4-5-6)	XXX

Note: The reserves created out of revaluation of assets, write back of depreciation and amalgamation have been excluded in the aforesaid calculation.

(Signature of *Statutory Auditor*) Name:

Seal:

Place:

For (Name of Accounting Firm)

Name of Partner/Proprietor

Membership Number

Rubber Stamp

7.9. Form T-9 Format for Submission of Detailed methodology and technical work plan

Supported with broad system architecture and design.

Sub.: Request For Proposal (RFP) for Design, Supply, Installation, Testing, Commissioning and Operation & Maintenance of Advanced Traffic Management System (ATMS) projects in Zone-1 (Delhi Region) on EPC mode

Ref: RFP No.: IHMCL/ATMS/Zone-Delhi Region/2026/01, dated 20 May 2026 on above subject.

NOTE:

- i. Submission under this item is subject to evaluation under technical bid, while giving information, the Bidders are advised to strictly focus and address the topic/sub-topic as asked for in a structured manner. Any superfluous submission shall be at Bidders' risk.
- ii. IHMCL/IHMCL's Representative may seek clarification on any of the submission made by the Bidder in form T-9. Any superfluous submission or inconsistent clarification with respect to site condition, is liable to make the bid non-responsive.

Dated: /...../2025

- i. System design document for field systems with a List of items with quantity of equipment:

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- ii. Command & Control Center Hardware design document with a list of items with quantity, architecture & components

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iii. Methodology of implementation:

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iv. Equipment Delivery Schedule and Time schedule to complete the entire work supported with Bar Chart, including the civil works for ATMS:

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v. Make, model, specs, and Brochure of all major components (hardware & software)*:

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vi. Any other aspects the Bidder may wish to add:

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*Any equipment/hardware not conforming to OEM criteria given in RFP shall make the bid liable to be rejected.

7.10. Form T-10 PROFORMA FOR SUBMITTING WRITTEN QUERIES

(To be submitted in excel/editable format only at the given email address⁵)

To,
Chief Operating Officer
Indian Highways Management Company Limited
G 5&6, Sector-10, Dwarka,
New Delhi – 110075

Sub.:Request For Proposal (RFP) for Design, Supply, Installation, Testing, Commissioning and Operation & Maintenance of Advanced Traffic Management System (ATMS) projects in Zone-1 (Delhi Region) on EPC mode

Ref: RFP No.: IHMCL/ATMS/Zone-Delhi Region/2026/01 dated 20 May 2026 on above subject.

Dated: /...../2025

Name of Company: _____, Name of Person _____

Contact No. _____,

Email Id: _____

Sr. No.	Page no. of RFP	Clause	RFP Statement	Query	Remarks

Note: To be submitted in editable MS excel format only.

⁵ Email id – tenders@ihmcl.com

7.11. Form T-11 Bank Guarantee for Bid Security

(Refer Clauses 3.3 of Part-I of Instructions to Bidders)

B.G.No.

Dated:

1. In consideration of you, ****, having its office at **** (hereinafter referred to as the "Authority", which expression shall, unless it be repugnant to the subject or context thereof, include its successors and assigns), having agreed to receive the BID of and having its registered office at (and acting on behalf of its JV) (hereinafter referred to as the "Bidder", which expression shall, unless it be repugnant to the subject or context thereof, include its/their executors, administrators, successors, and assigns), for *Request For Proposal (RFP) for Design, Supply, Installation, Testing, Commissioning and Operation & Maintenance of Advanced Traffic Management System (ATMS) projects in Zone-1 (Delhi Region) on EPC mode* (hereinafter referred to as "the Project") pursuant to the RFP Document dated issued in respect of the Project and other related documents, including without limitation the draft contract Agreement (hereinafter collectively referred to as "Bidding Documents"), we (Name of the Bank) having our registered office at and one of its branches at (hereinafter referred to as the "Bank"), at the request of the Bidder, do hereby, in terms of Clause 3.3 read with Clause 3.4 of the RFP Document, irrevocably, unconditionally, and without reservation guarantee the due and faithful fulfilment and compliance of the terms and conditions of the Bidding Documents (including the RFP Document) by the said Bidder and unconditionally and irrevocably undertake to pay forthwith to the Authority an amount of Rs. ***** (Rupees ***** only) (hereinafter referred to as the "Guarantee") as our primary obligation without any demur, reservation, recourse, contest, or protest and without reference to the Bidder if the Bidder shall fail to fulfil or comply with all or any of the terms and conditions contained in the said Bidding Documents.
2. Any such written demand made by the Authority stating that the Bidder is in default of the due and faithful fulfilment and compliance with the terms and conditions contained in the Bidding Documents shall be final, conclusive, and binding on the Bank.
3. We, the Bank, do hereby unconditionally undertake to pay the amounts due and payable under this Guarantee without any demur, reservation, recourse, contest, or protest and without any reference to the Bidder or any other person and irrespective of whether the claim of the Authority is disputed by the Bidder or not, merely on the first demand from the Authority stating that the amount claimed is due to the Authority by reason of the failure of the Bidder to fulfil and comply with the terms and conditions contained in the Bidding Documents, including failure of the said Bidder to keep its BID open during the BID validity period set forth in the said Bidding Documents for any reason whatsoever. Any such demand made on the Bank shall be conclusive as regards the amount due and payable by the Bank under this Guarantee. However, our liability under this Guarantee shall be restricted to an amount not exceeding Rs. *** ** (Rupees *** ** only).
4. This Guarantee shall be irrevocable and remain in full force for a period of 180 (one hundred and eighty) days from the BID Due Date inclusive of a claim period of 60

- (sixty) days or for such extended period as may be mutually agreed between the Authority and the Bidder, and agreed to by the Bank, and shall continue to be enforceable till all amounts under this Guarantee have been paid.
5. We, the Bank, further agree that the Authority shall be the sole judge to decide as to whether the Bidder is in default of due and faithful fulfilment and compliance with the terms and conditions contained in the Bidding Documents, including, inter alia, the failure of the Bidder to keep its BID open during the BID validity period set forth in the said Bidding Documents, and the decision of the Authority that the Bidder is in default as aforesaid shall be final and binding on us, notwithstanding any differences between the Authority and the Bidder or any dispute pending before any Court, Tribunal, Arbitrator, or any other Authority.
 6. The Guarantee shall not be affected by any change in the constitution or winding up of the Bidder or the Bank or any absorption, merger, or amalgamation of the Bidder or the Bank with any other person.
 7. In order to give full effect to this Guarantee, the Authority shall be entitled to treat the Bank as the principal debtor. The Authority shall have the fullest liberty, without affecting in any way the liability of the Bank under this Guarantee, from time to time to vary any of the terms and conditions contained in the said Bidding Documents or to extend the time for the submission of the BIDs or the BID validity period or the period for conveying acceptance of the Letter of Award by the Bidder or the period for fulfilment and compliance with all or any of the terms and conditions contained in the said Bidding Documents by the said Bidder or to postpone for any time and from time to time any of the powers exercisable by it against the said Bidder and either to enforce or forbear from enforcing any of the terms and conditions contained in the said Bidding Documents or the securities available to the Authority, and the Bank shall not be released from its liability under these presents by any exercise by the Authority of the liberty with reference to the matters aforesaid or by reason of time being given to the said Bidder or any other forbearance, act or omission on the part of the Authority or any indulgence by the Authority to the said Bidder or by any change in the constitution of the Authority or its absorption, merger, or amalgamation with any other person or any other matter or thing whatsoever which under the law relating to sureties would but for this provision have the effect of releasing the Bank from its such liability.
 8. Any notice by way of request, demand, or otherwise hereunder shall be sufficiently given or made if addressed to the Bank and sent by courier or by registered mail to the Bank at the address set forth herein.
 9. We undertake to make the payment on receipt of your notice of claim on us addressed to [name of Bank along with branch address] and delivered at our above branch, which shall be deemed to have been duly authorized to receive the said notice of claim.
 10. It shall not be necessary for the Authority to proceed against the said Bidder before proceeding against the Bank, and the guarantee herein contained shall be enforceable against the Bank, notwithstanding any other security which the Authority may have obtained from the said Bidder or any other person and which shall, at the time when proceedings are taken against the Bank hereunder, be outstanding or unrealized.
 11. We, the Bank, further undertake not to revoke this Guarantee during its currency except with the previous express consent of the Authority in writing.

12. The Bank declares that it has power to issue this Guarantee and discharge the obligations contemplated herein; the undersigned is duly authorized and has full power to execute this Guarantee for and on behalf of the Bank.
13. For the avoidance of doubt, the Bank's liability under this Guarantee shall be restricted to Rs. *** crore (Rupees ***** crore only). The Bank shall be liable to pay the said amount or any part thereof only if the Authority serves a written claim on the Bank in accordance with paragraph 9 hereof, or before [*** (indicated date falling 180 days after the BID Due Date)].
14. This guarantee shall also be operatable at our Branch, New Delhi from whom, confirmation regarding the issue of this guarantee or extension / renewal thereof shall be made available on demand. In the contingency of this guarantee being invoked and payment thereunder claimed, the said branch shall accept such invocation letter and make payment of amounts so demanded under the said invocation.
15. The guarantor/bank hereby confirms that it is on the SFMS (Structural Finance Messaging System) platform & shall invariably send an advice of this Bank Guarantee to the designated bank of [Ministry/IHMCL/NHIDCL/State PWD/BRO], details of which is as under:

S.No.	Particulars	Details
1.	Name of Beneficiary	Indian Highways Management Company Limited
2.	Name of Bank	Canara Bank
3.	Account No.	8598201006217
4.	IFSC	CNRB0008598

Signed and Delivered by Bank

By the hand of Mr. /Ms.....,its and authorised official.

(Signature of the Authorised Signatory)

(Official-Seal

7.12. Form T-12 Format of Bank Guarantee for Performance Security/Additional Performance Security

(See Clauses 6.10 of Part-I: Instructions to Bidders)

To,
Chief Operating Officer
Indian Highways Management Company Limited
G 5&6, Sector-10, Dwarka,
New Delhi – 110075

WHEREAS:

- (A) ___[name and address of contractor] (hereinafter called the “**Contractor**”) and Indian Highways Management Company Limited, G-5 & 6, Sector 10, Dwarka, New Delhi - 110075, (hereinafter called the “**Authority**”) have entered into an agreement (hereinafter called the “**Agreement**”) for “Request For Proposal (RFP) for Design, Supply, Installation, Testing, Commissioning and Operation & Maintenance of Advanced Traffic Management System (ATMS) projects in Zone-1 (Delhi Region) on EPC mode “ subject to and in accordance with the provisions of the Agreement
- (B) The Agreement requires the Contractor to furnish a Performance Security for due and faithful performance of its obligations, under and in accordance with the Agreement, during the {Construction Period/ Defects Liability Period and Maintenance Period} (as defined in the Agreement) in a sum of Rs. cr. (Rupees crore) (the “**Guarantee Amount**”).
- (C) We, through our branch at (the “**Bank**”) have agreed to furnish this bank guarantee (*hereinafter called the “**Guarantee**”*) by way of Performance Security.

NOW, THEREFORE, the Bank hereby, unconditionally and irrevocably, guarantees and affirms as follows:

1. The Bank hereby unconditionally and irrevocably guarantees the due and faithful performance of the Contractor’s obligations during the {Construction Period/ Defects Liability Period and Maintenance Period} under and in accordance with the Agreement, and agrees and undertakes to pay to the Authority, upon its mere first written demand, and without any demur, reservation, recourse, contest or protest, and without any reference to the Contractor, such sum or sums up to an aggregate sum of the Guarantee Amount as the Authority shall claim, without the Authority being required to prove or to show grounds or reasons for its demand and/or for the sum specified therein.
2. A letter from the Authority, under the hand of an officer not below the rank of General Manager in the Indian Highways Management Company Limited, that the Contractor has committed default in the due and faithful performance of all or any of its obligations under and in accordance with the Agreement shall be conclusive, final and binding on the Bank. The Bank further agrees that the Authority shall be the sole judge as to whether the Contractor is in default in due and faithful performance of its obligations during and under the Agreement and its decision that the Contractor is in default shall be final and binding on the Bank, notwithstanding any differences between the Authority and the Contractor, or any dispute between them pending

- before any court, tribunal, arbitrators or any other authority or body, or by the discharge of the Contractor for any reason whatsoever.
3. In order to give effect to this Guarantee, the Authority shall be entitled to act as if the Bank were the principal debtor and any change in the constitution of the Contractor and/or the Bank, whether by their absorption with any other body or corporation or otherwise, shall not in any way or manner affect the liability or obligation of the Bank under this Guarantee.
 4. It shall not be necessary, and the Bank hereby waives any necessity, for the Authority to proceed against the Contractor before presenting to the Bank its demand under this Guarantee.
 5. The Authority shall have the liberty, without affecting in any manner the liability of the Bank under this Guarantee, to vary at any time, the terms and conditions of the Agreement or to extend the time or period for the compliance with, fulfillment and/ or performance of all or any of the obligations of the Contractor contained in the Agreement or to postpone for any time, and from time to time, any of the rights and powers exercisable by the Authority against the Contractor, and either to enforce or forbear from enforcing any of the terms and conditions contained in the Agreement and/or the securities available to the Authority, and the Bank shall not be released from its liability and obligation under these presents by any exercise by the Authority of the liberty with reference to the matters aforesaid or by reason of time being given to the Contractor or any other forbearance, indulgence, act or omission on the part of the Authority or of any other matter or thing whatsoever which under any law relating to sureties and guarantors would but for this provision have the effect of releasing the Bank from its liability and obligation under this Guarantee and the Bank hereby waives all of its rights under any such law.
 6. This Guarantee is in addition to and not in substitution of any other guarantee or security now or which may hereafter be held by the Authority in respect of or relating to the Agreement or for the fulfillment, compliance and/or performance of all or any of the obligations of the Contractor under the Agreement.
 7. Notwithstanding anything contained hereinbefore, the liability of the Bank under this Guarantee is restricted to the Guarantee Amount and this Guarantee will remain in force for the period specified in paragraph 8 below and unless a demand or claim in writing is made by the Authority on the Bank under this Guarantee all rights of the Authority under this Guarantee shall be forfeited and the Bank shall be relieved from its liabilities hereunder.
 8. The Guarantee shall cease to be in force and effect on ****\$. Unless a demand or claim under this Guarantee is made in writing before expiry of the Guarantee, the Bank shall be discharged from its liabilities hereunder.
 9. The Bank undertakes not to revoke this Guarantee during its currency, except with the previous express consent of the Authority in writing, and declares and warrants that it has the power to issue this Guarantee and the undersigned has full powers to do so on behalf of the Bank.
 10. Any notice by way of request, demand or otherwise hereunder may be sent by post

§ Insert date being 2 (two) years from the date of issuance of this Guarantee (in accordance with Clause 7.2 of the Agreement).

addressed to the Bank at its above referred branch, which shall be deemed to have been duly authorised to receive such notice and to effect payment thereof forthwith, and if sent by post it shall be deemed to have been given at the time when it ought to have been delivered in due course of post and in proving such notice, when given by post, it shall be sufficient to prove that the envelope containing the notice was posted and a certificate signed by an officer of the Authority that the envelope was so posted shall be conclusive.

11. This Guarantee shall come into force with immediate effect and shall remain in force and effect for up to the date specified in paragraph 8 above or until it is released earlier by the Authority pursuant to the provisions of the Agreement.
12. This guarantee shall also be operatable at our..... Branch at New Delhi, from whom, confirmation regarding the issue of this guarantee or extension / renewal thereof shall be made available on demand. In the contingency of this guarantee being invoked and payment thereunder claimed, the said branch shall accept such invocation letter and make payment of amounts so demanded under the said invocation.
13. The guarantor/bank hereby confirms that it is on the SFMS (Structural Finance Messaging System) platform & shall invariably send an advice of this Bank Guarantee to the designated bank of IHMCL, details of which is as under:

S. No.	Particulars	Details
1	Name of Beneficiary	Indian Highways Management Company Limited
2	Name of Bank	Canara Bank
3	Account No.	8598201006217
4	IFSC Code	CNRB0008598

Signed and sealed this day of, 20..... at SIGNED,
SEALED AND DELIVERED

For and on behalf of the Bank by: (Signature)

(Name)

(Designation)

(Code Number)

(Address)

NOTES:

- (i) The bank guarantee should contain the name, designation and code number of the officer(s) signing the guarantee.
- (ii) The address, telephone number and other details of the head office of the Bank as well as of issuing branch should be mentioned on the covering letter of issuing branch.

7.13. Form T-13 - Bidder Response Format for Technical Requirements

Bidders are required to provide comprehensive responses against each of the listed technical requirements. The response must clearly describe the proposed technical solution, relevant past deployment experience, and commitments for pre-production/sandbox demonstrations. All responses should be submitted in the prescribed format provided below, along with necessary supporting documents, references, or certificates. Incomplete or vague responses may lead to disqualification during technical evaluation.

S. No.	Technical Requirement/ Parameter	Pre-Production / Sandbox Commitment	Details of Proposed Technical Solution – To be submitted by Bidder*
1	Field Devices <ul style="list-style-type: none"> • AI-based incident detection • IP65+ rating • OTA updates • ONVIF/NTCIP compliance 	Commit to live feed simulation, firmware update test, and protocol handshake demo	
2	Edge Processing <ul style="list-style-type: none"> • Real-time failover • Legacy protocol support • Local inference 	Commit to failover simulation, protocol emulation, and inference test with sample footage	
3	Networking <ul style="list-style-type: none"> • SDN routing • Fast switchover • PoE-to-CCC • MPLS/OTN backbone 	Commit to link switchover test (<1s), SDN controller demo, and corridor-level routing simulation	
4	Middleware <ul style="list-style-type: none"> • Kafka/MQTT • ESB • Elastic clusters • API observability 	Commit to event stream simulation, ESB orchestration, and observability dashboard walkthrough	
5	Core Applications <ul style="list-style-type: none"> • Microservices • FASTag/VAHAN APIs • ML retraining • Predictive AI 	Commit to retraining workflow demo, bias audit report, and predictive traffic simulation	
6	Command & Control Centers (CCCs) <ul style="list-style-type: none"> • Observability dashboards • Splunk integration 	Commit to CCC mock-up, Splunk trace ingestion, and ticketing workflow simulation	

	<ul style="list-style-type: none"> • Anomaly detection • Auto ticketing 		
7	Security & Access <ul style="list-style-type: none"> • Role-based access • SOC/SIEM • CERT-In readiness • ISO/DPDP compliance 	Commit to access control test, SIEM alert simulation, and audit log generation	
8	O&M Tools <ul style="list-style-type: none"> • Health scripts • Remote diagnostics • SLA dashboards • Fault recovery workflows 	Commit to script execution logs, remote access demo, and fault recovery simulation	
9	Hybrid Cloud & Scalability <ul style="list-style-type: none"> • Cloud strategy • Elastic scale-out • Corridor-wise rollout 	Commit to scale-out test, corridor-wise deployment simulation, and cloud resource provisioning	
10	Interoperability <ul style="list-style-type: none"> • API-first design • NTCIP/REST/MQTT • Multi-vendor integration 	Commit to protocol handshake test, API call simulation, and multi-vendor sandbox demo	
11	Compliance & Certification <ul style="list-style-type: none"> • ISO • STQC • CERT-In • DPDP audit logs 	Commit to mock audit log generation and compliance dashboard walkthrough	

*The Bidder may submit a technical writeup separately, as required.

7.14. Form T-14 - Bid Securing Declaration Form

(To be submitted by Bidder on the Letter head)

Date: _____

Ref: RFP No.: IHMCL/ATMS/Zone-Delhi Region/2026/01, dated 20 May 2026

To,

Chief Operating Officer
Indian Highways Management Company Limited
G 5&6, Sector-10, Dwarka,
New Delhi – 110075

I/We. The undersigned, declare that:

I/We understand that, according to your conditions, bids must be supported by a Bid Securing Declaration.

I/We accept that I/We may be disqualified from bidding for any contract with you for a period of one year from the date of notification if I am /We are in a breach of any obligation under the bid conditions, because I/We

a) have withdrawn/modified/amended, impairs or derogates from the tender, my/our Bid during the period of bid validity specified in the form of Bid; or

b) having been notified of the acceptance of our Bid by the purchaser during the period of bid validity

i. fail or reuse to execute the contract, if required, or

ii. fail or refuse to furnish the Performance Security, in accordance with the Instructions to Bidders.

c) I/We understand this Bid Securing Declaration shall cease to be valid if I am/we are not the successful Bidder, upon the earlier of

i. the receipt of your notification of the name of the successful Bidder; or

ii. thirty days after the expiration of the validity of my/our Bid.

Signed: _____ p(insert signature of person whose name and capacity are shown) in
the capacity of _____ (insert legal capacity of person signing the Bid Securing Declaration)

Name: _____ (insert complete name of person signing the Bid Securing Declaration)

Duly authorized to sign the bid for an on behalf of (insert complete name of Bidder)

Dated on _____ day of _____ (insert date of signing)

7.15. Form T-15 - Undertaking for Compliance

Subject: Request For Proposal (RFP) for Design, Supply, Installation, Testing, Commissioning and Operation & Maintenance of Advanced Traffic Management System (ATMS) projects in Zone-1 (Delhi Region) on EPC mode - **Undertaking for Compliance**

Name of the Bidder:

S. No.	Equipment Name	OEM Name* Proposed by Bidder
	CCTV PTZ (TMCS) Cameras	
	Video Camera (Overview and Sideview)	
	ANPR Camera	

* The Bidder shall mention name of all the OEM(s) being proposed for the concerned equipment.

We undertake that the minimum specifications of the equipment mentioned in the RFP shall be provided by the above OEM(s) proposed by us in our ATMS solution to meet the functional requirements mentioned in the RFP.

Bidder Name:

Name of Person Holding Power of Attorney:

Signature:.....

Date:.....

7.16 Form T-16 - Certificate regarding Compliance with Restrictions under Rule 144 (xi) of the General Financial Rules (GFRs)

(To be on the letter head of the Bidder/ Each Member of the Consortium)

To,

Chief Operating Officer
Indian Highways Management Company Limited
G 5&6, Sector-10, Dwarka,
New Delhi – 110075

Sub: Request For Proposal (RFP) for Design, Supply, Installation, Testing, Commissioning and Operation & Maintenance of Advanced Traffic Management System (ATMS) projects in Zone-1 (Delhi Region) on EPC mode

Dear Sir,

With reference to your RFP document dated *** **\$, I/we, having examined the Bidding Documents and understood their contents, hereby undertake and confirm as follows:

I/We have read the clause regarding restrictions on procurement from a bidder of a country which shares a land border with India and on sub-contracting to contractors from such countries;

I certify that this Bidder is not from such a country or, if from such a country, has been registered with the Competent Authority as defined in Public Procurement Order no. F.no.6/18/2019- PPD dated 23rd July 2020 and will not sub-contract any work to a contractor from such countries unless such contractor is registered with the Competent Authority.

I hereby certify that this bidder fulfils all requirements in this regard and is eligible to be considered.

Yours faithfully,

Date:

(Signature of the Authorised signatory)

Place:

(Name and designation of the of the Authorised signatory)

Name and seal of Bidder/Each Member of the Consortium

Notes:

{Where applicable, evidence of valid registration by the Competent Authority shall be attached}.

In case the above certification is found to be false, this would be a ground for immediate rejection of Bid/termination and further legal action in accordance with law.

7.17 Form T-17: Curriculum Vitae (CV) Format

CONSULTANTS SHALL PREPARE THEIR SUBMISSION AS PER GUIDANCE HEREUNDER FOR THE CV OF EACH PROPOSED RESOURCE AS REQUIRED UNDER CLAUSE 6.8.3.2

CURRICULUM VITAE (CV)

Position Title and No.	{e.g., Project Director}
Name of Expert:	{Insert full name}
Date of Birth:	{day/month/year}
Country of Citizenship/Residence	
Total Years of Experience: (Relevant to the Proposed Profile/Expertise)	

Education: {List college/university or other specialized education, giving names of educational institutions, dates attended, degree(s)/diploma(s) obtained with their supporting copies}

Employment record relevant to the assignment: {Starting with present position, list in reverse order. Please provide dates, name of employing organization, titles of positions held, types of activities performed and location of the assignment, and contact information of previous clients and employing organization(s) who can be contacted for references. Past employment that is not relevant to the assignment does not need to be included.}

Period	Employing organization and your title/position. Contact information for references	Country	Summary of activities performed relevant to the Assignment
[e.g., May 2005-	[e.g., Ministry of, advisor/consultant to...		

present]	For references: Tel...../e-mail.....; Mr. Hbbbbbb, deputy minister]		

Membership in Professional Associations and Publications:

Language Skills (indicate only languages in which you can work): _____

Adequacy for the Assignment:

SI #	Project Details	Domain	Key Activities performed as required in the RFP Detailed Tasks Assigned
1	Name of Project: Client Name: Year of Assignment:		
2	Name of Project: Client Name: Year of Assignment:		
3	Name of Project: Client Name: Year of Assignment:		

Expert contact information: (e-mail, phone.....)

Certification:

I, the undersigned, certify that to the best of my knowledge and belief, this CV correctly describes myself, my qualifications, and my experience, and I am available to undertake the assignment in case of an award. I understand that any misstatement or misrepresentation described herein may lead to my disqualification or dismissal by the Client.

{day/month/year}

Name

Signature
Date

{day/month/year}

Name of authorized

Date

Signature

Representative of the Consultant

(the same who signs the Proposal)

7.18 Form T-18: Format for Self-Evaluation of Technical Score

Sl. #	Technical Evaluation Criteria	Maximum Marks	Marks provided by bidder in Self Evaluation	Supporting Documents in Technical Bid as per RFP Clause 6.8.3.2
A.	Bidder Profile	20		
A1	<p>Average Annual Turnover Average annual turnover of the Sole Bidder or any Member(s) of the Consortium individually or combined, in case of Consortium, during last three consecutive financial years, i.e. FY 2022-23, 2023-24, 2024-25</p> <p>Marks shall be allotted as given below:</p> <ul style="list-style-type: none"> Average annual turnover >Rs. 300 Crore = 10 marks Average annual turnover >= Rs. 200 Crore and up to Rs. 300 Crore = 5 marks Average annual turnover < Rs. 200 Crore = 0 marks <p>For the purpose of this criterion, annual turnover of only the bidding entity will be considered. Annual turnover of any parent, subsidiary, associated or other related entity will not be considered.</p>	10		
A2	<p>Certification The Sole Bidder or, any member of the Consortium, in the case of a Consortium, shall have a valid CMMI Level 3 or higher certificate as on the Bid Due Date.</p> <ul style="list-style-type: none"> Valid CMMI Level 5 certificate = 5 marks Valid CMMI Level 3 or 4 certificate = 3 marks 	5		
A3	Start-up Entity	5		

Sl. #	Technical Evaluation Criteria	Maximum Marks	Marks provided by bidder in Self Evaluation	Supporting Documents in Technical Bid as per RFP Clause 6.8.3.2
	<p>In case a Start-up entity duly recognized by DPIIT, Government of India, having demonstrable experience in the domain of AI/ML in past 3 years from bid due date, is a member of the JV/Consortium, marks shall be awarded as follows:</p> <ul style="list-style-type: none"> If any Start-up is part of JV/Consortium – 5 Marks No Start-up as a part of JV/Consortium – 0 Marks 			
B.	Relevant Project Experience	50		
B1	<p>The Sole Bidder or any Member(s) of the Consortium individually or combined (in case of Consortium) should have implemented, and successfully commissioned Traffic Monitoring Camera System / ANPR Camera System/ CCTV Surveillance Cameras System under any Smart City project, city surveillance/safe city project, or airport CCTV surveillance project, in India or abroad, awarded by Central/State Government departments/entities including PSUs/Autonomous Bodies within last seven 7 years prior as on the Bid due date.</p> <p>Marks shall be allotted as given below:</p> <ul style="list-style-type: none"> Cumulative number of cameras commissioned > 500 cameras – 20 marks Cumulative number of cameras commissioned - from 401 to 500 – 15 Marks 	20		

Sl. #	Technical Evaluation Criteria	Maximum Marks	Marks provided by bidder in Self Evaluation	Supporting Documents in Technical Bid as per RFP Clause 6.8.3.2
	<ul style="list-style-type: none"> Cumulative number of cameras commissioned - from 301 to 400 – 10 Marks Cumulative number of cameras commissioned - from 200 to 300 – 5 Marks Cumulative number of cameras commissioned - less than 200 – 0 Mark <p>Only completed project or Project which has achieved Go-Live and currently under O&M phase shall be considered for evaluation.</p>			
B2	<p>The Sole Bidder or any Member(s) of the Consortium individually or combined (in case of Consortium) should have experience of Installation and Commissioning of IT field devices/ sensors such as CCTV surveillance systems/ANPR Camera, traffic monitoring systems, incident detection system, environmental sensors, communication networks (OFC/Wireless), command & control centre under any Smart City project, city surveillance/safe city project, or airport CCTV surveillance project, in India or abroad, awarded by Central/State Government departments/entities including PSUs/Autonomous Bodies within last seven 7 years prior as on the Bid due date.</p> <p>Marks shall be allotted as given below:</p>	20		

Sl. #	Technical Evaluation Criteria	Maximum Marks	Marks provided by bidder in Self Evaluation	Supporting Documents in Technical Bid as per RFP Clause 6.8.3.2
	<p>Each project with contract value minimum Rs. 30 Crore (excl. taxes as applicable) = 10 marks, subject to maximum of 20 marks</p> <p>Only completed project or Project which has achieved Go-Live and currently under O&M phase shall be considered for evaluation.</p> <p>For the purpose of evaluation of this criterion, a project shall be considered only if it includes a dedicated Command and Control Center equipped with centralized integrated software application, video wall, along with ANY TWO of the following components:</p> <ul style="list-style-type: none"> v. Traffic monitoring or surveillance CCTV camera systems vi. Automated video-based incident detection and enforcement solutions vii. Vehicle speed violation detection solutions (e.g., radar, ANPR, or equivalent technologies) viii. Advanced video analytics solution for traffic operations and/or incident management. 			
B3	<p>The Sole Bidder or any Member(s) of the Consortium individually or combined (in case of Consortium) should have experience in implementation of projects involving laying of Optical Fibre Cable (OFC) infrastructure in India or abroad, awarded by Central/State Government departments/entities including PSUs/Autonomous Bodies within</p>	10		

Sl. #	Technical Evaluation Criteria	Maximum Marks	Marks provided by bidder in Self Evaluation	Supporting Documents in Technical Bid as per RFP Clause 6.8.3.2
	<p>last seven 7 years prior as on the Bid due date.</p> <p>Marks Distribution :</p> <ul style="list-style-type: none"> Cumulative OFC Implementation > 1500 km = 10 Marks Cumulative OFC Implementation 1001 – 1500 km = 8 Marks Cumulative OFC Implementation 500 – 1000 km = 5 Marks <p>Only completed project or Project which has achieved Go-Live and currently under O&M phase shall be considered for evaluation.</p>			
C	Approach & Methodology	20		
C1	<p>Approach & Methodology</p> <ul style="list-style-type: none"> Demonstrated level of understanding of the scope of work and other aspects of the project – 15 Marks <p>and</p> <ul style="list-style-type: none"> Project implementation plan, Work Break Down Schedule, Manpower Deployment Plan, Strategy for compliance to SLA defined – 5 marks 	20		
D	Key Resources	10		
D1	<p>Project Director</p> <p>Minimum requirement</p> <ul style="list-style-type: none"> c) Education: Full-Time MBA/MCA/M. Tech & B. Tech/B.E. from a reputed institute 	5		

Sl. #	Technical Evaluation Criteria	Maximum Marks	Marks provided by bidder in Self Evaluation	Supporting Documents in Technical Bid as per RFP Clause 6.8.3.2
	<p>d) Total Experience: At least 15 years in IT/ITS sector</p> <p>Marks distribution:</p> <ul style="list-style-type: none"> Experience more than 20 years – 5 marks Experience – from 15 years – 20 years – 3 marks 			
D2	<p>Project Manager</p> <p>Minimum requirement</p> <p>c) Education: Full-Time MBA/MCA/M. Tech & B. Tech/B.E. from a reputed institute</p> <p>d) Total Experience: At least 10 years in IT/ITS sector</p> <p>Marks distribution:</p> <ul style="list-style-type: none"> Experience more than 15 years – 5 marks Experience – from 10 years – 15 years – 3 marks 	5		

7.19 Form F-1: Format for Financial Bid Submission

(Attached separately to be downloaded from e-tender portal for on-line submission)

PART-III DRAFT FORM OF CONTRACT AGREEMENT

1.1. DRAFT CONTRACT AGREEMENT

No.

This Contract Agreement (hereinafter called the “Contract”) is made on this ____ day of the month of ___, 2025.

BETWEEN

Indian Highways Management Company Limited (IHMCL), incorporated under Companies Act 1956, and having its registered office at G 5 & 6, Sector 10, Dwarka, New Delhi-110075 (hereinafter referred to as the “IHMCL”, which expression shall, unless repugnant to or inconsistent with the context, mean and include its successors and assigns) of the first part.

AND

M/s _____, a company incorporated under the provisions of the Companies Act, 1956 and having its registered office at _____ (for and on behalf of Consortium comprising and (collectively the “Consortium”) with as its lead member (the “**Lead Member**”)) (hereinafter

referred to as the “*Contractor*” which expression shall unless repugnant to or inconsistent with the context, mean and include its successors and assigns) of the OTHER PART.

WHEREAS

- (a) the Contractor, in the ordinary course of its business, is engaged in providing similar services to their clients, and have represented to IHMCL through their bids, against Request For Proposal (RFP) for Design, Supply, Installation, Testing, Commissioning and Operation & Maintenance of Advanced Traffic Management System (ATMS) projects in Zone-1 (Delhi Region) on EPC mode that they have the required professional skills, personnel and technical resources to provide the required Services;
- (b) on the basis of the said Tender, IHMCL has adjudged the Contractor as a Successful Bidder and issued Letter of Award (LOA) No. dated __.__.2024 for the same;
- (c) the Contractor has agreed through their letter of acceptance No dated to provide the said Services on the terms and conditions set forth in this Contract Agreement and has also submitted performance bank guarantee equivalent to (Rs.) such that it remains valid until one year beyond completion of the contract.

NOW THEREFORE, in consideration of the foregoing and the respective covenants and agreements set forth in this Contract Agreement, the receipt and sufficiency of which is hereby acknowledged, and intending to be legally bound hereby, the Parties hereby agree as follows:

1. The mutual rights and obligations of the Contractor and IHMCL shall be as set forth in this Contract Agreement, in particular:
 - (a) The Contractor shall carry out the Services in accordance with the provisions of the Contract; and
 - (b) IHMCL shall make payments to the Contractor in accordance with the provisions of the Contract.
2. The following schedules/ appendices shall be deemed to form and be read and construed as part of this Contract Agreement viz.

	General Conditions of Contract
Schedule A:	The Site
Schedule B:	The Proposed ATMS Facilities
Schedule C:	Standards & Technical Specifications
Appendices:	
Appendix A	Copy of Financial Bid of the Contractor
Appendix B	Letter of Award issued by IHMCL.
Appendix C	Letter of Acceptance submitted by the Contractor
Appendix D	Copy of the Performance Security submitted by the Contractor including copies of confirmation provided by the respective bank.
Appendix E	Copy of the Technical Bid and/or any subsequent correspondence of the Contractor/ IHMCL
Appendix F	Copy of RFP Document and subsequent amendment / addendum including Minutes of Pre-bid Meeting, if any

IN WITNESS WHEREOF, the parties hereto have caused this Contract Agreement to be executed by their respective authorized representatives on the day and year first before written.

FOR AND ON BEHALF OF

(Indian Highways Management Company Limited) (Authorized Representative)

Name : _____ Designation _____
 Indian Highways Management Company Limited G-5&6, Sector – 10,
 Dwarka

New Delhi – 110075

FOR AND ON BEHALF OF

(M/s____) (Authorized Representative)

Name : _____ Designation : _____
 M/s _____
 Address : _____

In the presence of following
witnesses:

Name : _____

Name : _____

Designation_____

Designation : _

Indian Highways Management
Company Limited

M/s ____

G-5&6, Sector – 10, Dwarka

Address :_____

New Delhi – 110075

Name : _____

Name : _____

Designation_____

Designation : _

Indian Highways Management
Company Limited

M/s ____

G-5&6, Sector – 10, Dwarka

Address :_____

New Delhi – 110075

1.2. GENERAL CONDITIONS OF CONTRACT

1.2.1. Definition

The words and expressions beginning with capital letters and defined in this Contract Agreement shall, unless the context otherwise requires, have the meaning ascribed thereto herein and the words and expressions defined in the Schedules and used therein shall have the meaning ascribed thereto in the Schedules annexed hereto. Words used in capitals and not defined herein but defined in the RFP shall have the meaning as ascribed thereto in the RFP.

1.2.2. Interpretation

1.2.2.1. In this Contract Agreement, unless the context otherwise requires,

- a) references to any legislation or any provision thereof shall include amendment or re- enactment or consolidation of such legislation or any provision thereof so far as such amendment or re-enactment or consolidation applies or is capable of applying to any transaction entered into hereunder;
- b) references to laws of India or Indian law or regulation having the force of law shall include the laws, acts, ordinances, rules, regulations, bye laws or notifications which have the force of law in the territory of India and as from time to time may be amended, modified, supplemented, extended or re-enacted;
- c) references to a **“person”** and words denoting a natural person shall be construed as a reference to any individual, firm, company, corporation, society, trust, government, state or agency of a state or any association or partnership (whether or not having separate legal personality) of two or more of the above and shall include successors and assigns;
- d) the table of contents, headings or sub-headings in this Contract Agreement are for convenience of reference only and shall not be used in, and shall not affect, the construction or interpretation of this Contract Agreement;
- e) the words **“include”** and **“including”** are to be construed, without limitation and shall be deemed to be followed by **“without limitation”** or **“but not limited to”** whether or not they are followed by such phrases;
- f) any reference to any period of time shall mean a reference to that according to Indian Standard Time;
- g) any reference to day shall mean a reference to a calendar day;
- h) references to a **“business day”** shall be construed as a reference to a day (other than a Sunday and holidays) on which banks in their respective States are generally open for business;
- i) any reference to month shall mean a reference to a calendar month as per the Gregorian calendar;
- j) references to any date, period or time shall mean and include such date, period or time as may be extended pursuant to this Contract Agreement;
- k) any reference to any period commencing **“from”** a specified day or date and **“till”** or **“until”** a specified day or date shall include both such days or dates; provided that if the last day of any period computed under this Contract Agreement is not a business day, then the period shall run until the end of the next business day;
- l) the words importing singular shall include plural and vice versa;

- m) “**lakh**” means a hundred thousand (100,000) and “**crore**” means ten million (10,000,000);
- n) references to the “**winding-up**”, “**dissolution**”, “**insolvency**”, or “**reorganization**” of a company or corporation shall be construed so as to include any equivalent or analogous proceedings under the law of the jurisdiction in which such company or corporation is incorporated or any jurisdiction in which such company or corporation carries on business including the seeking of liquidation, winding-up, reorganization, dissolution, arrangement, protection or relief of debtors;
- o) save and except as otherwise provided in this Contract Agreement, any reference at any time to any agreement, deed, instrument, license or document of any description shall be construed as reference to that agreement, deed, instrument, license or other document as amended, varied, supplemented, modified or suspended at the time of such reference; provided that this Sub-clause shall not operate so as to increase liabilities or obligations of IHMCL hereunder or pursuant hereto in any manner whatsoever;
- p) any agreement, consent, approval, authorization, notice, communication, information or report required under or pursuant to this Contract Agreement from or by any Party shall be valid and effective only if it is in writing under the hand of a duly authorized representative of such Party, as the case may be, in this behalf and not otherwise;
- q) the Schedules and Recitals to this Contract Agreement form an integral part of this Contract Agreement and will be in full force and effect as though they were expressly set out in the body of this Contract Agreement;
- r) references to Recitals, Articles, Clauses, Sub-clauses or Schedules in this Contract Agreement shall, except where the context otherwise requires, mean references to Recitals, Articles, Clauses, Sub-clauses and Schedules of or to this Contract Agreement and references to a Paragraph shall, subject to any contrary indication, be construed as a reference to a Paragraph of this Contract Agreement or of the Schedule in which such reference appears; and
- s) the damages payable as set forth in this Contract Agreement, whether on per diem basis or otherwise, are mutually agreed genuine pre-estimated loss and damage likely to be suffered and incurred by the Party entitled to receive the same and are not by way of penalty (the “**Damages**”);
- t) “Arbitration Act” means the Arbitration and Conciliation Act, 1996 and shall include modifications to or any re-enactment thereof as in force from time to time;
- u) “SYSTEM” means “ATMS System”
- v) “Effective Date” shall mean date of this Contract Agreement;

1.2.2.2. Any word or expression used in this Contract Agreement shall, unless otherwise defined or construed in this Contract Agreement, bear its ordinary English meaning and, for these purposes, the General Clauses Act 1897 shall not apply.

1.2.2.3. Definitions

APTS	:	Automatic Power Transfer Switch
AI/ML	:	Artificial Intelligence/Machine Learning

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ATMS	:	Advanced Traffic Management System
BIS	:	Bureau of Indian Standards
BS	:	British Standard
CIF	:	Common Interface Format
CCTV	:	Closed Circuit Television
DLP	:	Defects Liability Period
DM	:	Disaster Management
DDMA	:	District Disaster Management Authority
ECB	:	Emergency Call Box
ERT	:	Emergency Road side Telephone
EN	:	European Standard
FAT	:	Factory Acceptance Tests
FPS	:	Frames Per Second
GUI	:	Graphical User Interface
HDPE	:	High-density polyethylene
HVAC	:	Heating Ventilation and Air
ICT	:	Information Communication Technology
IRC	:	Indian Roads Congress
IHMCL	:	Indian Highways Management Company
IIT	:	Indian Institute of Technology
ITM	:	Integrated Traffic Management
ITS	:	Intelligent Transport Systems
ITU-T	:	Telecommunication Standardization Sector of
JPEG	:	Joint Photographic Experts Group
LAN	:	Local Area Network
MET	:	Meteorological Data Systems
MoRTH	:	Ministry of Road Transport
MTBF	:	Mean Time between Failures
MTTR	:	Mean Time to Repair
NAS	:	Network-Attached Storage
NDMA	:	National Disaster Management Authority
NDRF	:	National Disaster Response Force
NIT	:	National Institute of Technology
IHMCL	:	Indian Highways Management Company

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NMS	:	Network Management System
NHAI	:	National Highways Authority of India
NVR	:	Network Video Recorder
OF	:	Optic Fibre
OFC	:	Optic Fibre Cable
O&M	:	Operation and Maintenance
PIJF	:	Polythene Insulated Jelly-filled
PTZ	:	Pan, Tilt, Zoom
SAT	:	Site Acceptance Test
SDMA	:	State Disaster Management Authority
SIT	:	System Integration Test
Solar	:	PV Solar Photo voltaic
SWB	:	Static Weighbridge
TEC	:	Telecommunication Engineering Centre (DOT)
UPS	:	Uninterruptible Power Supply
VMS	:	Variable Message Signs
WAN	:	Wide Area Network
WIM	:	Weigh-in-motion
WPC	:	Wireless Planning Council

Note: The document uses “ATMS Contractor”, “Service Provider” and “Service Integrator” interchangeably. They refer to the Agency engaged by IHMCL for execution of ATMS works.

1.2.2.4. Arithmetic conventions

All calculations shall be done to 2 (two) decimal places, with the third digit of 5 (five) or above being rounded up and below 5 (five) being rounded down.

1.2.2.5. Priority of Agreements, Clauses and Schedules

- 1.2.2.5.1. In case of inconsistency between the provisions of this Contract Agreement and the RFP, the terms of this Contract Agreement shall prevail to the extent of such inconsistency.
- 1.2.2.5.2. In case of ambiguities or discrepancies within this Contract Agreement, the followings shall apply:
 - a) between two or more Clauses of this Contract Agreement, the provisions of a specific Clause relevant to the issue under consideration shall prevail over those in other Clauses;
 - b) between any two Schedules/Articles, the Schedule / Article relevant to the issue shall prevail;

- c) between the written description on the drawings/design documents, if any, and the Specifications and Standards, the latter shall prevail; and
- d) between any value written in numerals and that in words, the latter shall prevail.

1.2.3. Scope of Project

Under this Agreement, the scope of the Project shall mean and include:

- a) Construction of the ATMS Facility on the Site set forth in Schedule- A with provision of Facilities as specified in Schedule-B in conformity with the Specifications and Standards set forth in Schedule-C
- b) Operations & maintenance of the Advanced Traffic Management System in accordance with the provisions of this Agreement and in conformity with the requirements set forth in Schedule-C; and
- c) performance and fulfilment of all other obligations of the Contractor in accordance with the provisions of this Agreement and matters incidental thereto or necessary for the performance of any or all of the obligations of the Contractor under this Agreement.

1.2.4. Relationship between the Parties

Nothing contained herein shall be construed as establishing a relationship of master and servant or of principal and agent as between IHMCL and the Contractor. The Contractor, subject to this Contract Agreement, has complete charge of Personnel performing the Services and shall be fully responsible for the Services performed by them or on their behalf hereunder. Contractor shall alone be responsible for the remuneration and statutory compliance with respect to its employees, contractors or representatives. IHMCL has no liability w.r.t. the representatives/ employees of the Contractor. Contractor will keep IHMCL fully indemnified in this regard.

1.2.5. Governing Law and Jurisdiction

This Contract Agreement shall be construed and interpreted in accordance with and governed by the laws of India, and the courts at Delhi shall have exclusive jurisdiction over matters arising out of or relating to this Contract Agreement.

1.2.6. Language

This Contract Agreement has been executed in English, which shall be the binding and controlling language for all matters relating to the meaning or interpretation of this Contract Agreement.

1.2.7. Effectiveness of Contract

This Contract Agreement shall come into effect on the date the Contract is signed by both the Parties. The date, the Contract comes into effect is defined as the Effective Date.

1.2.8. Commencement of Services

The Contractor shall commence the Services from the date of Handing over the site.

1.2.9. Expiration of Contract

The term of this Contract Agreement shall be for a period of 5 (five) years and 12 Months with effect from Effective Date, with the initial 12 Months as the construction period and the balance period starting from immediately succeeding the completion of implementation and up to the end of the term of this Contract Agreement as operation and maintenance period. Any additional implementation work awarded

during these five years and 12 months period shall be adjusted as implementation and O&M in such a manner that the said period does not exceed beyond the initial five years and 12 months or additional extended period thereof, if approved by IHMCL, as the case may be.

The Contract Period may be extendable up to maximum of 1 year on the same terms and conditions, at sole discretion of IHMCL. In the event the Contract is extended beyond the initial Operation & Maintenance (O&M) period of five (5) years, the O&M payments for the extended period of one (1) year shall be made on a quarterly basis at the rate of three percent (3%) of the Total O&M cost per quarter. Accordingly, a total of twelve percent (12%) of the Total O&M cost shall be payable for the extended one-year period, subject to satisfactory performance, SLA and compliance with the provisions of the Contract Agreement.

1.2.10. Assignment

This Contract Agreement shall not be assigned by the Contractor to any person / agency except with the prior consent in writing of IHMCL and IHMCL shall be entitled to decline without assigning any reason whatsoever.

Notwithstanding anything to the contrary contained in this Contract Agreement, IHMCL may, after giving 30 days' notice to the Contractor, assign and/ or transfer any of its rights and benefits and/or obligations under this Contract Agreement to an assignee who is, in thereasonable opinion of IHMCL, capable of fulfilling all of the IHMCL's then outstanding obligations under this Contract Agreement.

1.2.11. Severability

If for any reason whatsoever any provision of this Contract Agreement is or becomes invalid, illegal or unenforceable or is declared by any court of competent jurisdiction or anyother instrumentality to be invalid, illegal or unenforceable, the validity, legality or enforceability of the remaining provisions shall not be affected in any manner, and the Parties will negotiate in good faith with a view to agreeing to one or more provisions which may be substituted for such invalid, unenforceable or illegal provisions, as nearly as is practicable to such invalid, illegal or unenforceable provision. Failure to agree upon any such provisions shall not be subject to the Dispute Resolution Procedure set forth under thisContract Agreement or otherwise.

1.2.12. Notices

Any notice, request or consent required or permitted to be given or made pursuant to this Contract Agreement shall be in writing. Any such notice, request or consent shall be deemedto have been given or made when delivered in person to an authorized representative of the Party to whom the communication is addressed, or when sent to such Party at the address specified below. The mode of service of any notice shall be either courier or registered post or e-mail or fax or by hand.

The addresses for service of Notice shall be:

Chief Operating Officer, IHMCL

Address: Indian Highways Management Company Limited,G-5&6, Sector-10,
Dwarka, New Delhi - 110075

E-mail: tenders@ihmcl.com

Contractor:

Attention:

Address:

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E-mail:.....

1.2.13. Time Schedule

The Total Implementation period of the Project shall be <12 months> and Operation & Maintenance period of 60 Months, which may be extendable up to 2 years as per requirement of IHMCL.

SL #	Activity	Timelines
1.	Date of Contract Signing	T
2.	Submission of System Design document	T + 1 month
3.	Finalization of locations for ATMS sub-components viz. TMCS, VIDES, VMS, VASD and identification of local ATMS Command & Control Centers in consultation with concerned PIU/IHMCL	T + 3 months
4.	“Go-Live” of ATMS systems in 1st tranche of 300 km , including setting up of local ATMS CCCs	T + 6 months
5.	“Go-Live” of ATMS systems in 2nd tranche of 300 km stretches with integration with local ATMS CCC	T + 8 months
6.	Setting up of Regional ATMS CCC, and integration with all Local ATMS CCC	T + 8 months
7.	“Go-Live” of ATMS systems in 3rd tranche of 300 km stretches with integration with local ATMS CCC	T + 10 months
8.	“Go-Live” of ATMS systems in 4th tranche for remaining balance km of project length with integration with local ATMS CCC and integration of all projects with Regional ATMS CCC	T + 12 months

Note:

- **Definition of ‘Go-Live’** - “Go-Live” shall mean the completion of all associated civil works, including installation of gantries, poles and related infrastructure; laying of the OFC backbone; supply, installation and commissioning of the ATMS systems; and successful testing and integration with the designated Local ATMS Command & Control Centres (CCCs).
- The ATMS Contractor shall complete all the requisite works, including installation, commissioning, and testing of the systems and Offer for Site Acceptance Testing (SAT) at least fifteen (15) days in advance for each tranche of ATMS stretches.

1.2.14. Damages

1.2.14.1. Damages for Delay in completion of work

Failure by the Contractor to complete the works of the Construction Period in all respect within the prescribed Time Period mentioned in Payment Milestone shall result in the application of the damages for delays unless Extension of Time has been granted by IHMCL for reasons not attributable to the Contractor. The damages

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for the delay attributable to the Contractor shall be levied as under:

- A. Delay in completing Milestone mentioned in Clause 1.2.17: In the event of delay in achieving any of the Payment Milestones specified in the table above, damages shall be levied at the rate of 0.04% of the value of the respective Payment Milestone for each day of delay or part thereof, subject to a maximum of 10% (ten percent) of the value of that Milestone. The amount so calculated shall be withheld from the Contractor's invoice for the concerned Milestone.

However, if the Contractor achieves completion of the final Milestone (i.e., "Go-Live" of ATMS systems for the entire project with full integration with the Regional ATMS Command & Control Centre) within the prescribed timeline, the withheld amounts against earlier Milestones shall be released to the Contractor along with the payment due for the final Milestone. In case the final Milestone is also delayed, the withheld amounts shall stand appropriated as damages.

Illustration: Damages for Delay in Milestones:

Milestone	Value (% of Contract Price)	Status	Delay (days)	Damages (@0.04% per days, max 10% of milestone)	Amount Withheld	Adjustment on Final Completion
I	1%	Delayed	35	$0.04\% \times 35 = 1.40\%$ of Milestone I = 0.014%	0.014% (provisionally withheld)	Since Final Milestone delayed → appropriated as damages
II	10%	On time	0	Nil	Nil	Full payment released
VI (Final)	10%	Delayed	28	$0.04\% \times 28 = 1.12\%$ of Milestone VI = 0.112%	0.112%	Withheld amount appropriated as damages

Total Damages Appropriated = $(0.014\% + 0.112\%)$ 0.126% of Contract Price

- B. Once the liquidated damages reach maximum limit, IHMCL may terminate the contract and forfeit the performance bank guarantee. IHMCL also reserves the right to debar the Contractor from further participation in IHMCL's subsequent tenders due to its non- performance for a period of 5 years.
- C. Upon termination of the Agreement due to service defaults, IHMCL may choose to allocate the said site to any other Contractor, at its sole discretion and at the risk and cost of the defaulting Contractor.
- D. In case of delay due to reasons beyond the control of the Contractor, upon such request from the Contractor and recommendation from the IHMCL (or its representatives), IHMCL may, in its sole discretion, consider suitable extension of time (EOT) without imposing any liquidated damages upon the Contractor. However, the Contractor shall submit such request at least 30 days before the completion schedule.

1.2.14.2. Damages for Non-Compliance to Safety Standards at site

Failure by the Contractor's personnel in maintaining the safety standards at the site at any time shall attract damages on every instance noticed by the IHMCL (or its representatives).

- i. Staff working without safety gears – damages of Rs. 10,000 per instance. In case of repeated instance by the same staff member of the Contractor, the damages shall be doubled per instance. The Contractor shall have to replace the repeated offenders / personal (safety lapses more than 3 times) with immediate effect.
- ii. Improper safety measures at site / safety hazard to the commuters due to poor workmanship, etc., / Contractor's vehicle wrongly parked at site / Contractor's vehicle moving in wrong direction / working during low visibility hours or at night time without proper safety measures warning signages and lighting/ improper traffic diversion / non-standard warning signages etc. / unauthorised lane closure / traffic rule violation – minimum damages of Rs. 1,00,000 per instance shall be imposed on recommendation of the IHMCL (or its representatives) . In case of repeated instance, the penalty shall be doubled per instance. The Contractor shall have to replace the repeated offenders / personal (safety lapses more than 2 times) with immediate effect. IHMCL shall also take legal action against the errant staff / sub-contractor of the Contractor, as such safety lapses may lead to major safety concern / hazard for the road users as well as the workers.
- iii. Damage to Road Assets - In the event of any damage to road assets caused by the ATMS Contractor during the Contract Period, the Contractor shall, at its own cost, restore the damaged asset to its original condition within three (03) days from the date of intimation by IHMCL or its authorized representative. Any delay in carrying out such restoration shall attract liquidated damages of not less than Rs. 1,00,000 (Rupees One Lakh only) per instance, as imposed on the recommendation of IHMCL or its authorized representative. In the event of repeated instances of such damage, the penalty shall stand double for each subsequent occurrence.

1.2.14.3. Damages for non-adherence of Service Level Agreement (SLA)

Non-Adherence of SLA during the O&M period would result in damages mentioned in Schedule-C of the Contract Agreement. The damages will be recovered from periodic O&M payments.

1.2.15. Payments

1.2.15.1. Contract Price

- (i) IHMCL shall make payments to the Contractor on the basis of the Price quoted by the Bidder in the Form F-1 and accepted by the Authority in consideration of the obligations specified in this Agreement for an amount of Rs. (Rupees..... only) (the "Total Price"), which shall be paid as per the Scheduled Milestone mentioned at Clause No 1.2.17
- (ii) Except for the Goods and Service Tax (GST), the Contract Price includes all duties, taxes, royalty, cess, charges, and fees that may be levied in accordance with the laws and regulations in force. The GST shall be paid extra upon submitting the proof of deposition.
- (iii) Unless otherwise stated in this Agreement, the Contract Price covers all the Contractor's obligations for the Works under this Agreement and all things necessary for the Construction, Operation and Maintenance and the remedying of

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any Defects in the ATMS.

- (iv) All payments shall be made in Indian Rupee (Rs.), and the System Integrator shall bear any foreign exchange fluctuation risks, as applicable.

1.2.16. Advance Payment

Deleted

1.2.17. Payment Milestone

The Payment shall be released to the ATMS Contractor as per following payment milestones:

Payment Milestone	Description	Timelin e	Payment Milestone Amount
Implementation Period			
I	Approval of Detailed Design Document and Sign-off on finalised locations identified for TMCS, VIDCS, VMS and VASD and local ATMS Command & Control Centers for various projects, pursuant to Schedule-C and Schedule-B	T + 3 months	1% of Total Contract Price
II	“Go-Live” of ATMS systems in 1st tranche of 300 km , including setting up of local ATMS CCCs.	T + 6 months	Capex Value of BOQ Line Items for the Project stretch on pro-rata basis, as per rates in Financial Bid Format Note: The entire sub-system shall be integrated to local, national and regional NMS and its health check validated. The integration with distant NMS can be exhibited on appropriate application/ terminals.
III	“Go-Live” of ATMS systems in 2nd tranche of 300 km stretches with integration with local ATMS CCC	T + 8 months	
IV	Setting up of Regional ATMS CCC, and integration with all Local ATMS CCC	T + 8 months	
V	“Go-Live” of ATMS systems in 3rd tranche of 300 km stretches with integration with local ATMS CCC	T + 10 months	
VI	“Go-Live” of ATMS systems in 4th tranche for remaining balance km of project length with integration with local ATMS CCC and integration of all projects with Regional ATMS CCC.	T + 12 months	
Operation & Maintenance Period			
During the O&M Period, pro-rata Quarterly O&M payments of the Total O&M cost calculated as per Note (ii) provided below, shall commence after Go-Live ATMS System for each tranche of km of project stretch as above as follows:			
1st Year of O&M – Four equal quarterly payments @ 2%		Qtr	8%
2nd Year of O&M – Four equal quarterly payments @ 2.25%		Qtr	9%
3rd Year of O&M – Four equal quarterly payments @ 2.5%		Qtr	10%
4th Year of O&M – Four equal quarterly payments @ 2.75%		Qtr	11%
5th Year of O&M – Four equal quarterly payments @ 3%		Qtr	12%

Where, T = Date of signing of the Contract Agreement

Note:

- i. The quantities of ATMS sub-components such as TMCS, VIDES, VASD, VMS, OFC, etc., indicated in the Financial Bid Form are indicative and provided solely for bidding purposes. The actual quantities shall be determined based on the approved detailed design and relevant Schedules. Payment shall be made strictly on a pro-rata basis, corresponding to the actual quantities installed and commissioned at site, in accordance with Clause 1.2.17.
- ii. The Total CAPEX Price (A) quoted in the Financial Bid Form shall not exceed 50% of the Total Contract Price (A+B). In the event that the quoted Total CAPEX Price (A) exceeds 50% of the Total (A+B), payment during the Implementation Phase shall be limited to 50% of the Total (A+B), apportioned across the relevant BOQ Line Items on a pro-rata basis. The balance eligible amount shall be disbursed as part of the Quarterly O&M payments under the Total O&M Price (B), proportionately spread over the O&M Period.

Illustration:

If a Bidder quotes ₹60 as Total CAPEX Price (A) and ₹100 as Total (A+B), only ₹50 (being 50% of ₹100) shall be payable towards CAPEX during the Implementation Phase on a pro-rata basis across the applicable BOQ Line Items. The remaining ₹10 shall be distributed proportionately over the O&M Period and paid along with the Quarterly O&M payments.

1.2.18. Payment during Operation & Maintenance (O&M) Period

The ATMS Contractor shall be paid Quarterly O&M payments as indicated above after the issue of completion certificate during the O&M Period. For avoidance of doubt the first O&M payment shall be eligible after three months from the date "Go-Live". In the event the Contractor fails to meet the Service Level Requirement, it shall be deemed as failure of the O&M obligation of the Contractor and IHMCL shall be entitled to effect reduction in the quarterly O&M payment in accordance with Schedule-C.

1.2.19. Change of Scope

- i. The Contractor shall be entitled for additional payment over and above the Contract Price in case of Change of Scope Order is given by IHMCL. Change of Scope will be initiated in following cases only after written instructions from IHMCL or its representative:
 - a. Variation in number of VIDES or VASD or VMS locations with respect to those mentioned in the Schedule-B.

For avoidance of doubt, any variation in quantity(ies) of equipment, support system, OFC, Civil/Mechanical Works, Software/Hardware etc. of ATMS Components whose locations are mentioned in Schedule-B or any software/App upgradation works mentioned in Schedule-C shall not constitute any Change of Scope.
 - b. Variation in number of TMCS: Any increase beyond ten percent (10%) in the total quantities of TMCS cameras shall be treated as a variation, subject to prior approval of IHMCL.

Any increase of up to ten percent (10%) in the total quantities of Traffic Monitoring and Camera System (TMCS) items specified in Schedule B shall not constitute a Change of Scope (CoS), and Bidders shall factor such variation into their bids.

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For the avoidance of doubt, TMCS shall be deemed to include all associated sub-components, including cameras, poles, LPU, civil and mechanical works, networking, and communication systems.

- ii. Notwithstanding anything contained elsewhere in the RFP/Contract, the Authority reserves the right to vary the original scope of work during the Contract Period, based on project requirements, field conditions, operational considerations, or policy directives as below:
 - (a) The cumulative variation in quantity for each Component/ individual BoQ line item as provided in the Financial Bid Form may be increased or decreased by up to 25% of the originally specified quantity as per RFP, on the same terms, conditions, and rates as specified in the Contract.

It is clarified that any positive variation in TMCS sub-components under this Clause shall be considered in addition to the increase of up to ten percent (10%) in TMCS quantities as provisioned under Clause 1.2.19(b) above.
 - (b) Any such variation within the aforesaid limits shall not entitle the Concessionaire/Contractor to claim any additional cost, compensation, or revision of rates, other than payment for the actual quantity of work executed at the rates specified in the Contract.
 - (c) Any Variations in quantity for any BoQ line item beyond the limit of 25%, if required, shall be undertaken through market discovery by IHMCL, and shall be subject to approval of the Competent Authority.
 - (d) The decision of the Authority regarding the necessity, extent, and manner of variation, including adoption of market-discovered rates beyond the above limits, shall be final and binding on the Concessionaire/Contractor.
- iii. Upon receipt of written instruction from IHMCL or its representative, the Contractor shall submit the Change of Scope proposal within 15 days duly including the estimate, design drawing of the work along with functional and technical specifications and time required for completion of the additional work, to IHMCL or its representative for issue of the Change of Scope Order.

1.2.20. Project Administration

The IHMCL designates COO, IHMCL, as its coordinator, who will be responsible for the coordination of activities under this Contract Agreement, for acceptance and finalisation of the services and of other deliverables by IHMCL and for receiving and approving invoices for the payment. IHMCL may appoint Supervision Consultant to act on its behalf.

1.2.21. Fraud and Corruption

1.2.21.1. Definitions

It is IHMCL's policy that IHMCL as well as Contractors observe the highest standard of ethics during the selection and execution of such contracts. In pursuance of this policy, IHMCL defines, for the purpose of this provision, the terms set forth below as follows:

- i. "corrupt practice" means the offering, receiving, or soliciting, directly or indirectly, of anything of value to influence the action of a public official in the selection process or in contract execution;
- ii. "fraudulent practice" means a misrepresentation or omission of facts in order to influence a procurement process or execution of a contract with IHMCL; and

includes collusive practice among Bidders, prior to or after bid submission, designed to establish bid prices at artificially high or non-competitive levels and to deprive IHMCL of the benefits of free and open competition;

- iii. “collusive practices” means a scheme or arrangement between two or more Bidders, with or without the knowledge of IHMCL, designed to establish prices at artificial, non- competitive levels;
- iv. “coercive practices” means harming or threatening to harm, directly or indirectly, persons or their property to influence their participation in a procurement process, or affect the execution of a contract;
- v. “unfair trade practices” means supply of services different from what is ordered on, or change in the Scope of Work which was not agreed to; and
- vi. “restrictive practices” means forming a cartel or arriving at any understanding or arrangement among Bidder(s) with the objective of restricting or manipulating a full and fair competition in the Bidding Process.

1.2.21.2. Measures to be taken by IHMCL

- i. IHMCL may terminate the contract if it determines at any time that representatives of the Contractor were engaged in corrupt, fraudulent, collusive or coercive practices during the selection process or the execution of that contract, without the Contractor having taken timely and appropriate action satisfactory to IHMCL to remedy the situation;
- ii. IHMCL may also sanction against the Contractor, including blacklisting / declaring the Contractor ineligible, either indefinitely or for a stated period of time, to be awarded a contract if it at any time determines that the Contractor has, directly or through an agent, engaged in corrupt, fraudulent, collusive or coercive practices in competing for, or in executing, a contract with IHMCL.

1.2.22. Confidentiality of the Assignment/Findings

The Contractor shall not, during the term of this Contract Agreement and within three years after its expiration or termination, disclose or permit to be disclosed any proprietary or confidential information relating to the services, this Contract Agreement or the IHMCL’s business or operations without the prior written consent of IHMCL to any third party other than its agents, consultants, or subcontractors who need to know in connection with the purpose for which it was disclosed and who are bound to preserve the confidentiality thereof, to any person outside its organization, any Proprietary Information.

The Contractor and its personnel shall use such Proprietary Information only for the purpose for which it was disclosed and shall not use or exploit such Proprietary Information for its own benefit or the benefit of another without the prior written consent of the IHMCL. Without limitation of the foregoing, Contractor shall not cause or permit reverse engineering of any Proprietary Information or recompilation or disassembly of any information or software programs which are part of the Proprietary Information received by it under this Contract Agreement. For the purposes of this Contract Agreement Proprietary information shall include but not be limited to terms of this Contract Agreement, strategies, official secrets, actual and anticipated research, developments or plans, services, software, source codes, inventions, processes, discoveries, formulas, architectures, concepts, ideas, designs, drawings, personnel, financial information, demonstrations, operations, records, assets, technology, data and information derived whether existing or derived / analysed out of the information made available to the Contractor in form of raw data or reports, in any form whatsoever.

The Contractor alone shall be responsible to ensure the maintenance of confidentiality as contemplated above and shall be responsible to employ sufficient measures to prevent any unauthorised access of the Proprietary information.

1.2.23. Insurance cover to be maintained

- a) The Contractor shall ensure to maintain proper insurance coverage of all the equipment, materials, establishment against fire, theft, vandalism or any other perceived risk(s) / natural disaster etc during the entire duration of the contract period.
- b) In addition to material and equipment, the Contractor shall also ensure to have adequate insurance for all its personal working/ deployed under this Contract Agreement. The insurance shall also fully cover the personnel / workers / labourers of sub-contractors. In case any worker / labourer claim is not covered by the insurance company, the Contractor shall be responsible for covering the entire expenses for medical, transportation, wages, compensation etc. of the personnel in case of any incident / accident/ mishap / death, etc. Suitable compensation shall be paid by the Contractor to the personnel deployed at the project in case of any incident / accident/ mishap / death, etc. if any happened on the site/ project or in transit, irrespective of thereason. Hence the insurance policy shall be comprehensive and shall cover all types of risks and compensation.
- c) The Contractor shall indemnify IHMCL against any damage/ loss of property or personnel of Contractor working on any site under this Contract Agreement.
- d) The Contractor shall submit the copy of insurance policies to IHMCL within 15 days of issuance of LOA renewal policy within 15 days of the expiry of the policy till the end of the Contract period. Penalty of Rs. 10,000 shall be levied on the Contractor for delay of each working day from the due day of submission / expiry of the insurance policy documents.

1.2.24. Labour Laws

- a) The Contractor shall obtain all relevant labour registrations and comply with all relevant labour laws applying to its employees, and shall duly pay them and afford to them all their legal rights.
- b) The Contractor shall make all deductions of tax at source and all contributions to the Payment of Gratuity, Provident Fund (including Employees' contribution) and Employees' State Insurance Scheme as may be required by Applicable Laws and deposit the aforesaid contributed amount with the appropriate authority/(s).
- c) The Contractor shall require all personnel engaged in the Works to obey all Applicable Laws and regulations. The Contractor shall permit Authority to witness labour payments for the Contractors direct labour, or the Subcontractors labour. The Contractor shall ensure that all its Sub-contractors strictly comply with all labour laws.
- d) Documentary evidence confirming the above compliance, as may be required from time to time, shall be provided to the IHMCL's Representative.
- e) IHMCL shall not be liable for any delay/default of the Contractor in compliance of the labour laws

1.2.25. No partnership

This Contract Agreement shall not be interpreted or construed to create an

association, joint venture or partnership between the Parties, or to impose any partnership obligation or liability upon either Party and neither Party shall have any right, power or authority to enter into any agreement or undertaking for, or act on behalf of, or to act as an agent or representative of, or to otherwise bind, the other Party.

1.2.26. Intellectual Property Rights

All Intellectual Property of the respective Parties shall continue to vest with the respective Party and one Party may make use of the Intellectual Property only with the express consent of the other Party. However, it is agreed and acknowledged by the Contractor that intellectual property rights in the Proprietary Information as well as any other data or information/ reports generated during the performance of services contemplated herein by the Contractor shall always vest with IHMCL and Contractor will not have any right in such IPR whatsoever.

1.2.27. Force Majeure

Neither party shall in any event be liable for any failure to perform its obligations under this Contract Agreement due to any events beyond the reasonable control of either party or any events of force majeure. No Party shall be considered in default of performance of its obligations under the terms of this Contract Agreement, if such performance is prevented or delayed for any causes beyond the reasonable control of the Party affected by such event (hereinafter referred to as “ **Affected Party**”), including, but not limited to, fire, flood, explosion, acts of God, public disorder, riots, embargoes, or strikes, acts of military authority, epidemics, strikes, lockouts or other labour disputes, insurrections, civil commotion, war, enemy actions which substantially bars the performance of obligations of the Affected Party (hereinafter referred to as “**Force Majeure Event**”)

1.2.27.1. Reporting of Force Majeure

If a Force Majeure Event arises in the aforesaid manner, the Affected Party shall within maximum 24 hours notify the other Party in writing of such condition and the cause thereof. However, in case the Contractor claims to have suffered a Force Majeure Event, the Contractor shall continue to perform its obligations under this Contract Agreement as far as is reasonably practical, and shall seek all reasonable alternative means for performance, unless otherwise directed by IHMCL.

1.2.27.2. Mitigate the Force Majeure Event

Upon occurrence of Force Majeure Event, the Affected Party shall immediately take steps as are reasonably necessary to remove the causes resulting in Force Majeure if within its control and to mitigate the effect thereof. Any costs incurred and attributable to such event or curing of the Force Majeure Event shall be solely borne by the Affected Party.

1.2.28. Dispute Resolution

1. Resolution of Disputes

- a) Any dispute, difference or controversy of whatever nature howsoever arising under or out of or in relation to the Contract (including its interpretation) between the Parties, and so notified in writing by either Party to the other Party (the “Dispute”) shall, in the first instance, be attempted to be resolved amicably in accordance with the conciliation procedure.
- b) The Parties agree to use their best efforts for resolving all Disputes arising under or in respect of the Contract promptly, equitably and in good faith, and

further agree to provide each other with reasonable access during normal business hours to all non-privileged records, information and data pertaining to any Dispute.

- c) **Mediation:** In the event of any Dispute between the Parties, either Party may call upon the Chairman in case of IHMCL or his nominee and the Managing Director/ /CEO/Director in case of the Service Provider to mediate in arriving at an amicable settlement thereof. If after expiry of 30 days of receipt of the documents in relation to the Dispute or such extended period as the Parties may agree in writing, the Dispute remains unresolved, the Parties shall attempt to resolve the dispute through conciliation and/or Arbitration under the Arbitration and Conciliation Act, 1996.
- d) **Conciliation:** The Parties shall attempt to select one of the experts from the list of empaneled arbitrators of the Society for Affordable Redressal of Disputes ("SAROD") as the Conciliator to mediate and assist the Parties in arriving at an amicable settlement thereof. If the Parties fail to agree on nominating a conciliator within 15 (fifteen) days or the Dispute is not resolved as evidenced by the signing of written terms of settlement within 60 (sixty) days of the notice in writing or such longer period as may be mutually agreed by the Parties, either Party may refer the Dispute to arbitration.
- e) **Arbitration**
 - a. Any Dispute which is not resolved amicably by conciliation, shall be finally settled by arbitration as set forth below:
 - b. The Dispute shall be referred to Society For Affordable Redressal of Disputes (SAROD). The dispute shall be dealt with in terms of Rules of SAROD. The detailed procedure for conducting Arbitration shall be governed by the Rules of SAROD and provisions of Arbitration & Conciliation Act, 1996, as amended from time to time.
 - c. The seat of Arbitration shall be New Delhi and the language for all documents and communications between the parties shall be English.
 - d. The expenses incurred by each party in connection with the preparation, presentation, etc., of arbitral proceedings shall be borne by each party itself.
 - e. The arbitrators shall make a reasoned award (the "Award").
 - f. The Service Provider and IHMCL agree that an Award may be enforced against the Service Provider and/or IHMCL and their respective assets wherever situated.
 - g. This Agreement and the rights and obligations of the Parties shall remain in full force and effect, pending any proceedings hereunder. Further, the Parties unconditionally acknowledge and agree that notwithstanding any Dispute between them, each Party shall proceed with the performance of its respective obligations, pending resolution of Dispute.
- 2. The Bidding Process shall be governed by, and construed in accordance with, the laws of India and courts at New Delhi shall have exclusive jurisdiction over all

disputes arising under, pursuant to and/or in connection with the Bidding Process.

3. IHMCL, in its sole discretion and without incurring any obligation or liability, reserves the right, at any time, too.
 - (i) Suspend and/or cancel the Bidding Process and/or amend and/or supplement the Bidding Process or modify the dates or other terms and conditions relating there to.
 - (ii) Consult with any Bidder to receive clarification or further information.
 - (iii) Retain any information and/ or evidence submitted to IHMCL by, on behalf of, and/ or in relation to any Bidder; and/or.
 - (iv) Independently verify, disqualify, reject and/ or accept all submissions or other information and/or evidence submitted by or on behalf of any Bidder.
4. IHMCL is not bound to reply/ respond to any representation/ letter or request for Change in Scope of work, eligibility criteria or any relaxation in respect of the tender conditions.
5. It shall be deemed that by submitting the Bid, the Bidder agrees and releases IHMCL, its employees, agents and advisers, irrevocably, unconditionally, fully and finally from any and all liability for claims, losses, damages, costs, expenses or liabilities in any way related to or arising from the exercise of any rights and/or performance of any obligations hereunder, pursuant hereto and/or in connection with the Bidding Process and waives, to the fullest extent permitted by Applicable Law, any and all rights and/ or claims it may have in this respect, whether actual or contingent, whether present or in future.
6. Verification and Dis-qualification: IHMCL reserves the right to verify all statements, information, and documents submitted by the Bidder in response to this RFP, and the Bidders shall, when so required by IHMCL, make available all such information, evidence, and documents as may be necessary for such verification. Any such verification or lacks such verification, by IHMCL shall not relieve the Bidders of its obligations or liabilities hereunder, nor will it affect any rights of IHMCL thereunder.
7. IHMCL reserves the right to reject any Bid and/ or declare it non-responsive, if:
 - i. At any time, a material misrepresentation is made or uncovered, or
 - ii. The Bidder does not provide, within the time specified by IHMCL, the supplemental information sought by IHMCL for evaluation of the Bid.
8. Such misrepresentation/ improper response shall lead to the disqualification of the Bidder. If such disqualification/ rejection occurs after the bids have been opened and the lowest Bidder gets disqualified/ rejected, then IHMCL reserves the right to take any such measure as may be deemed fit in the sole discretion of IHMCL, including annulment of the Bidding Process.

1.2.29. Events of default by the Contractor

The failure on the part of the Contractor to perform any of its obligations or comply with any of the terms of this Contract shall constitute an Event of Default on the part of the Contractor. The events of default as mentioned above may include inter-alia of the following:

- a. the Contractor fails to provide, extend, or replenish, as the case may be, the Performance Security in accordance with this Agreement;
- b. the Contractor abandons or manifests intention to abandon the Construction or O&M of the Project without the prior written consent of the Authority;
- c. the Project Completion Date does not occur within the period specified in RFP Clause 1.2.17 for the Scheduled Completion Date, or any extension thereof accorded under Clause 1.2.14.(D);
- d. the Contractor fails to rectify any Defect, the non-rectification of which shall have a Material Adverse Effect on the Project, within the time specified in this Agreement or as directed by the Authority;
- e. the Contractor subcontracts the Works or any part thereof in violation of this Agreement or assigns any part of the Works or the Maintenance without the prior approval of the Authority;
- f. the Contractor creates any Encumbrance in breach of this Agreement;
- g. an execution levied on any of the assets of the Contractor, or if a trustee or receiver is appointed for the Contractor or for the whole or material part of its assets that has a material bearing on the performance of the Contractor under the Contract Agreement;
- h. the Contractor is adjudged bankrupt or insolvent, has been, or is in the process of being liquidated, dissolved, wound-up;
- i. the Contractor has been, or is in the process of being amalgamated or reconstituted in a manner that would cause, in the reasonable opinion of the Authority, a Material Adverse Effect or would be in breach of the terms of the Contract Agreement;
- j. any representation or warranty of the Contractor herein contained which is, as of the date hereof, found to be false or that the Contractor is at any time hereafter found to be in breach or non-compliance thereof;
- k. the Contractor submits to the Authority any statement, notice or other document, in written or electronic form, which contains false contentions/ information and can potentially adversely impact the Authority's rights, obligations or interests if accepted on its face value;
- l. the Contractor has failed to fulfil any obligation, for which failure Termination has been specified in this Agreement;
- m. the Contractor commits a default in complying with any other provision of this Agreement if such a default causes a Material Adverse Effect on the Project or on the IHMCL;
- n. Gives or offers to give (directly or indirectly) to any person any bribe, gift, gratuity, commission, or other thing of value, as an inducement or reward:
 - i. for doing or forbearing to do any action in relation to the Contract, or
 - ii. for showing or forbearing to show favour or disfavour to any person in relation to the Contract, or

- iii. if any of the Contractor's personnel, agents, or subcontractors give or offer to give (directly or indirectly) to any person any such inducement or reward as is described in this sub-paragraph (s). However, lawful inducements and rewards to Contractor's Personnel shall not entitle termination.

1.2.30. Consequences of Default

Where an Event of Default subsists or remains uncured then IHMCL shall be entitled to:

- 1) Impose any such obligations and conditions and issue any clarifications as may be necessary to inter alia ensure smooth continuation of project and the Services which the Contractor shall be obliged to comply with. The Contractor shall in addition take all available steps to minimize loss resulting from such event of default.
- 2) Where there has been an occurrence of such defaults inter alia as stated above, the IHMCL shall issue a notice of default to the Contractor, setting out specific defaults / deviances / omissions / non-compliances / non-performances and providing a notice of Thirty (30) days to enable such defaulting party to remedy the default committed.

1.2.31. Termination

- a) Without prejudice to any other rights or remedies which the Authority may have under this Agreement, upon occurrence of a Contractor Default, the Authority shall be entitled to terminate this Agreement by issuing a Termination Notice to the Contractor; provided that before issuing the Termination Notice, the Authority shall by a notice inform the Contractor of its intention to issue such Termination Notice and grant 15 (fifteen) days to the Contractor to make a representation, and may after the expiry of such 15 (fifteen) days, whether or not it is in receipt of such representation, issue the Termination Notice.
- b) Notwithstanding the above, IHMCL at its sole discretion may terminate the Contract Agreement any time by giving 30 days prior notice without assigning any reason.
- c) Contract can be terminated by either party on occurrence of a Force Majeure event.

1.2.32. Consequences of Termination

- a) Upon Termination, the Contractor shall, without delay or demur, transfer all equipment, relevant documents / information/ software application developed under the contract / sources code / back up / data/ permissions to IHMCL or any other entity as directed by it;
- b) Upon Termination under clause 1.2.31 (a), IHMCL shall be entitled to appropriate the Performance Security.
- c) Upon Termination under clause 1.2.31 (b), the Authority shall make Termination Payment for the value of the completed stage of the Works as per Clause 1.2.17, less payments already made, and shall adjust from the sum thereof (i) any other amounts payable or recoverable, as the case may be, in accordance with the provisions of this Agreement, and all taxes due to be deducted at source.

1.2.33. Taking over

After the expiry of the Maintenance Period set forth in the Contract Agreement and any extension thereof, the Contractor shall handover the entire ATMS facility including all sub-systems, equipment, software, source code, data, backup data and any other material / document set forth in this Agreement, to IHMCL or its representative in running condition.

1.2.34. Survival of rights

Notwithstanding anything to the contrary contained in this Contract Agreement, any Termination pursuant to the provisions of this Contract Agreement shall be without prejudice to the accrued rights of either Party including its right to claim and recover money damages, security deposits, and other rights and remedies which it may have in law or contract.

1.2.35. Indemnification

- a) The Contractor shall indemnify, defend, save and hold harmless, IHMCL and NHAI and Ministry of Road Transport and Highways (MoRTH) and its Officers, Agents, Engineer, against any direct loss, damage, claims, cost and expense of whatever kind and nature (including without limitation, legal fees, claims and expenses incurred in connection with any suit, action or proceeding or any claim asserted, such as fees and expenses incurred), joint or several, that arise out of or are based upon any order passed by any statutory authority including courts, tribunals or other judicial/ quasi – judicial authorities, on account of breach of the Contractor's obligations under this Contract Agreement or any other related agreement or otherwise, any fraud or negligence attributable to the Contractor or its Agents or Sub-Contractors, under contract or tort or on any other ground whatsoever, all eventualities of theft, dacoity, robbery, etc., except to the extent that any such suits, proceedings, actions, demands and claims has arisen due to any breach or default of this Contract Agreement on the part of IHMCL.
- b) The Contractor shall indemnify IHMCL and NHAI and MoRTH of all legal obligations of its professionals deployed. IHMCL and NHAI and MoRTH also stand absolved of any liability on account of death or injury sustained by the Contractor's staff during the performance of their work and also for any damages or compensation due to any dispute between the Contractor and its staff.
- c) The remedies provided under this Article are not exclusive and shall not limit any rights or remedies that may otherwise be available to IHMCL Indemnified Party at law or in equity.
- d) The provisions of this Article shall survive Termination.

1.2.36. Compensation for default by the Contractor

- 1) In the event of the Contractor being in breach of this Contract Agreement, unless such default or delay is on account of Force Majeure or through no fault of the Contractor, the Contractor shall pay to IHMCL, all direct costs suffered or incurred by IHMCL as a consequence of such breach, within 30 days of receipt of the demand supported by necessary particulars thereof.
- 2) The Contractor shall pay to IHMCL all direct costs suffered or incurred by IHMCL incurred as a result of any and all losses, claims, damages and liabilities (including, without limitation, legal fees and other expenses incurred in connection with any suit, action or proceeding or any claim asserted, such as fees and expenses incurred), joint or several, that arise out of, or based

upon:

- i. any untrue statement or misrepresentation of a material fact provided by the Contractor or an omission to state a material fact required to be communicated;
- ii. any non-performance or breach of the roles, responsibilities, representations, warranties, undertakings and declarations contained herein by the Contractor or its directors, employees, personnel or representatives.
- iii. negligence, fraud or misconduct of the Contractor or any of its employees, agents, affiliates or advisors.

1.2.37. Cap on Liability of Parties

Notwithstanding anything stated herein above and under any circumstances, the liability of Contractor under this Clause for each site shall not exceed the total contract price.

1.2.38. Representation and warranties of the Contractor

The Contractor declares, represents, and warrants as follows:

- 1) It is duly organized and validly existing under the laws of India, and has full power and authority to execute and perform its obligations under this Contract Agreement and to carry out the works and provide services contemplated hereby;
- 2) It has taken all necessary corporate actions under Applicable Laws to authorize the execution and delivery of this Contract Agreement and to validly exercise its rights and perform its obligations under this Contract Agreement;
- 3) It has obtained all necessary internal/external approvals, registrations and certifications required from relevant authorities and other entities for fulfilling its obligations as set out in this Contract Agreement;
- 4) It has not violated any of the conditions subject to which such approvals, registrations and certifications have been granted or any other applicable regulations and / or guidelines or directives or statutes;
- 5) It shall ensure that such approvals, registrations and certifications will remain in force, including, by taking prompt steps for timely renewal of the same;
- 6) It undertakes to continue to comply with all Applicable Laws with respect to its roles / obligations under this Contract Agreement;
- 7) There are no actions, suits, proceedings, or investigations pending before any court or before any other judicial, quasi-judicial or other authority, the outcome of which may result in the breach of this Contract Agreement or which individually or in the aggregate may result in any material impairment of its ability to perform any of its obligations under this Contract Agreement;
- 8) It shall at no time sub-contract any of its obligations under this Contract Agreement without the prior permission from IHMCL. IHMCL. Provided that in case in case the Contractor proposes to sub-contract any of its obligations under this Contract Agreement, it shall seek written permission along with the details of the activities that it proposes to sub-contract to third parties;
- 9) No representation or warranty by the Contractor contained herein or in any

other document furnished by it to IHMCL in relation to Applicable Laws contains or will contain any untrue or misleading statement of material fact or omits or will omit to state a material fact necessary to make such representation or warranty not misleading;

- 10) No sums, in cash or kind, have been paid or will be paid, by or on behalf of the Contractor, to any person by way of fees, commission or otherwise for securing the award of this Contract Agreement or for entering into this Contract Agreement or for influencing or attempting to influence any officer or employee of IHMCL in connection therewith.

Schedule-A – Site of the Project

1. Site of the Project

This Zone covers the ATMS projects in Delhi NCR covering approximately 1205 Km of which Full ATMS Implementation of about 408 Km and ATMS Upgradation with VIDES of 797 Km. The PIU wise details are provided as below:

S. No.	PIU	Full ATMS Implementation (in Km) Approx	ATMS Upgradation with VIDES (in Km) Approx	Total Length (in Km) Approx
1	Rewari	77	190	267
2	Mathura	0	59	59
3	Ghaziabad	0	113	113
4	Meerut	37	193	230
5	Baghpat	252	78	330
6	Bhiwani	43	163	205
	Grand Total	408	797	1205

a. The details of ATMS Projects under various PIUs are as below:

Sr. No.	Project Name	PIUs	Length (in Km) Approx	Full-Scale ATMS OR ATMS Upgradation
1	Muzaffarnagar-Miranpur section of NH-709AD	Meerut	26	Full-Scale ATMS
2	Spur to Muzaffarnagar project	Meerut	11	Full-Scale ATMS
3	Six laning & strengthening of NH-248A from Existing Km 2+740 (Rajiv Chowk) to Km 11+682 in Gurugram on HAM in the state of Haryana (Package-I).	Rewari	9	Full-Scale ATMS
4	Delhi-Gurgaon-Kotputli NH-48	Rewari	63	Full-Scale ATMS
5	Dharuhera-Bhiwadi Link Road	Rewari	5	Full-Scale ATMS
6	Delhi Meerut Expressway (NE-3) PKG-1	Ghaziabad	8	ATMS Upgradation
7	Delhi Meerut Expressway (NE-3) PKG-2	Ghaziabad	19	ATMS Upgradation
8	Delhi Meerut Expressway (NE-3) PKG-3	Ghaziabad	22	ATMS Upgradation
9	Delhi Meerut Expressway (NE-3) PKG-4	Ghaziabad	32	ATMS Upgradation
10	Delhi-Saharanpur (NH 709B) PKG-1	Ghaziabad	15	ATMS Upgradation
11	Delhi-Saharanpur (NH 709B) PKG-2	Ghaziabad	17	ATMS Upgradation
12	Western UP Tollway Private Limited, Operations and Maintenance of NH-58 from km. 52+250 to km. 130+560 Meerut – Muzaffarnagar section in the state of Uttar Pradesh	Meerut	78	ATMS Upgradation

RFP for Design, Supply, Installation, Testing, Commissioning and O&M of ATMS
projects in Zone-Delhi NCR on EPC mode

Sr. No.	Project Name	PIUs	Length (in Km) Approx	Full-Scale ATMS OR ATMS Upgradation
13	Four-Laning of Meerut-Bulandshahar section of NH-235 from Km 8.800 (Design chainage Km 8.800) to Km 66.482 (Design chainage Km 73.512) in the state of Uttar Pradesh on Hybrid Annuity Mode	Meerut	61	ATMS Upgradation
14	Meerut-Najibabad section of NH-119	Meerut	54	ATMS Upgradation
15	Six laning & Strengthening of NH-248A from existing km. 11.682 to km. 24.400 (Design Ch. Km. 9.282 to km. 22.000) under NHDP phase IV in the state of Haryana on Hybrid Annuity Mode(Package-II)	Rewari	13	ATMS Upgradation
16	Construction of the proposed Panyala mode Narnaul to Dhani Bathoda and Section of NH-11 from km 12.00 to km 31.00 as an Economic Corridor & Feeder route in the state of Haryana on "Hybrid Annuity Mode"	Rewari	46	ATMS Upgradation
17	Construction of the proposed Narnaul Bypass and Ateli Mandi to Narnaul Section of NH-11 from km 43.445 to km 56.900 as an Economic Corridor & Feeder route in the state of Haryana on "Hybrid Annuity Mode"	Rewari	41	ATMS Upgradation
18	Upgradation of Rewari-Ateli Mandi section of NH-11 from Ex. km 11.780 at Rewari to Ex. Km 43.445 at Ateli Mandi (designed length 31.000 Km) as feeder route in the State of Haryana on "Hybrid Annuity Mode"	Rewari	30	ATMS Upgradation
19	Construction of Proposed Rewari Bypass (Designed Length 14.4 Km.) as Feeder route in the State of Haryana on Hybrid Annuity Mode:	Rewari	14	ATMS Upgradation
20	4/6 laning of Narnaul Bypass Crossing to Paniyala Mor (NH-148B) (at NH-48 Junction) = 31.24 Km, Nizampur Link Road=2.76 Km & Narnaul Bypass Crossing to Pachari Kalan=11.30 Km (NH-11) in the State of Haryana under Bharatmala Pariyojana on Hybrid Annuity Mode (HAM)	Rewari	45	ATMS Upgradation
21	Construction of Six lane access control Highway from DND Maharani Bagh to Junction with Jaitpur-Pushta Road Section of NH-148NA (Design Ch.0.000 to 9.000 in the National Capital Territory of Delhi on Hybrid Annuity Mode (HAM) under Bharatmala Pariyojana (NHAI/BM/DND-KMP/NH-148NA/IE-I)	Mathura	9	ATMS Upgradation
22	Construction of Six Lane access-controlled Highway from Junction with Jaitpur-Pushta Road to Junction with Sector 62/65 dividing road on Faridabad – Ballabhgarh Bypass Section of NH-148NA (Design Ch. 09+000 to 33+000) including spur from Design Ch. 13+200 to Junction of Faridabad -Ballabhgarh Bypass with NH-19 near Badarpur Border in the state of Haryana on Hybrid Annuity Mode under Bharatmala Pariyojana	Mathura	24	ATMS Upgradation

RFP for Design, Supply, Installation, Testing, Commissioning and O&M of ATMS
projects in Zone-Delhi NCR on EPC mode

Sr. No.	Project Name	PIUs	Length (in Km) Approx	Full-Scale ATMS OR ATMS Upgradation
23	Construction of Six Lane access-controlled Highway from Junction with Sector-62/65 dividing road on Faridabad - Ballabhgarh Bypass to Junction near KMP Expressway with NH-148N (Delhi-Vadodara Expressway) Section of NH-148NA (Design Ch. 33+000 to 59+063) Pkg-III in state of Haryana on Hybrid Annuity Mode under Bharatmala Pariyojana	Mathura	26	ATMS Upgradation
24	4L PS of EPE Crossing to start of Shamli Bypass from Km. 92.20 to Km. 155.025 of existing NH-709-B	Baghpat	61	Full-Scale ATMS
25	2L of HR/UP Border - Baghpat - Meerut from km. 0.00 to km. 41.36 & from km. 45.84 to km. 48.26	Baghpat	44	Full-Scale ATMS
26	4L PS of Meerut to after Bridge over River Yamuna, Haryana via Shamli-from km. 0.00 to km. 88.476 of NH-709A	Baghpat	84	Full-Scale ATMS
27	Shamli Byapss- Saharanpur from km 92.2 to km 155.025	Baghpat	63	Full-Scale ATMS
28	Panipat – Shamli	Baghpat	36	ATMS Upgradation
29	Shamli – Muzzafarnagar	Baghpat	43	ATMS Upgradation
30	4L Ismailabad-Ambala NH-152	Bhiwani	43	Full-Scale ATMS
31	Delhi-Amritsar-Katra PKG 3	Bhiwani	31	ATMS Upgradation
32	Delhi-Amritsar-Katra PKG 4	Bhiwani	29	ATMS Upgradation
33	Delhi-Amritsar-Katra PKG 5	Bhiwani	38	ATMS Upgradation
34	Jalbehra-Shahbad NH152G	Bhiwani	23	ATMS Upgradation
35	Bhiwani-Hansi NH 148B	Bhiwani	43	ATMS Upgradation

2. Location of Regional ATMS CCC

The Regional ATMS Command & Control Center (CCC) is proposed to be located at Sohna, NE - 4, Ch. 000+000 km.



Schedule – B

1. Project Background

The Advanced Traffic Management System (ATMS) is a flagship initiative of NHAI aimed at enhancing road safety, enabling intelligent traffic management, and ensuring seamless enforcement across India's National Highways and Expressways. The project seeks to establish a future-ready ATMS backbone in identified project stretches in select PIUs of NHAI in Zone 1 – Delhi Region by leveraging AI-driven technologies, advanced analytics, and integrated surveillance and

Development of the ATMS Project shall include Design, Supply, Installation, Testing, in Commissioning and Operation & Maintenance of Advanced Traffic Management System (ATMS) at the stretches listed in Schedule-A, with the provision of facilities and Scope work as specified in Schedule-B, and ensure compliance with the Specifications and Standards outlined in Schedule-C.

The Project execution shall be categorized into following implementation types:

- **Full-Scale ATMS Implementation:** For corridors/stretch/projects requiring end-to-end installation of the complete ATMS system with sub-systems, defined as per NHAI Guidelines, October 2023 or as amended from time to time, including enforcement, traffic management, and field communication infrastructure.
- **ATMS Upgradation with VIDES Components:** For corridors/stretch where older ATMS systems are already deployed by other stakeholders and require upgradation with VIDES component and connectivity and requisite manpower set up in the existing Control center.

2. Key Project Objectives

- a) Deployment of AI-enabled Advanced Traffic Management Systems (ATMS) on National Highways and Expressways
- b) Upgradation of brownfield ATMS projects for improved incident management and enforcement (Upgradation with VIDES component)
- c) Establishment of a multi-tier ATMS Command & Control Center (CCC) framework to enable corridor-level monitoring and incident response, zonal supervisory control and enforcement, and centralized data aggregation for analytics, national dashboards.

3. Description of the ATMS Project

- a. The Authority has envisaged implementation of ATMS system on the project to enhance road safety, make road-travel efficient & sustainable, and enable stress-free travel by adoption of ATMS.
- b. Advanced Traffic management and control systems shall be composed of field equipment and sensors that will collect information on road conditions, traffic conditions, violations, incidents, and shall be sent to the ATMS Command and Control center. ATMS system shall provide necessary information on roads, traffic, incidents, and environment to road users, and alerts regarding violations and incidents to the enforcement agencies / rescue team 24 hours a day 365 days a year to ultimately ensure safe and smooth traffic as described in this Annex-II of Schedule-B.

c. The ATMS Project shall include the following components to be provided as per the functional and technical specifications mentioned in Schedule-C:

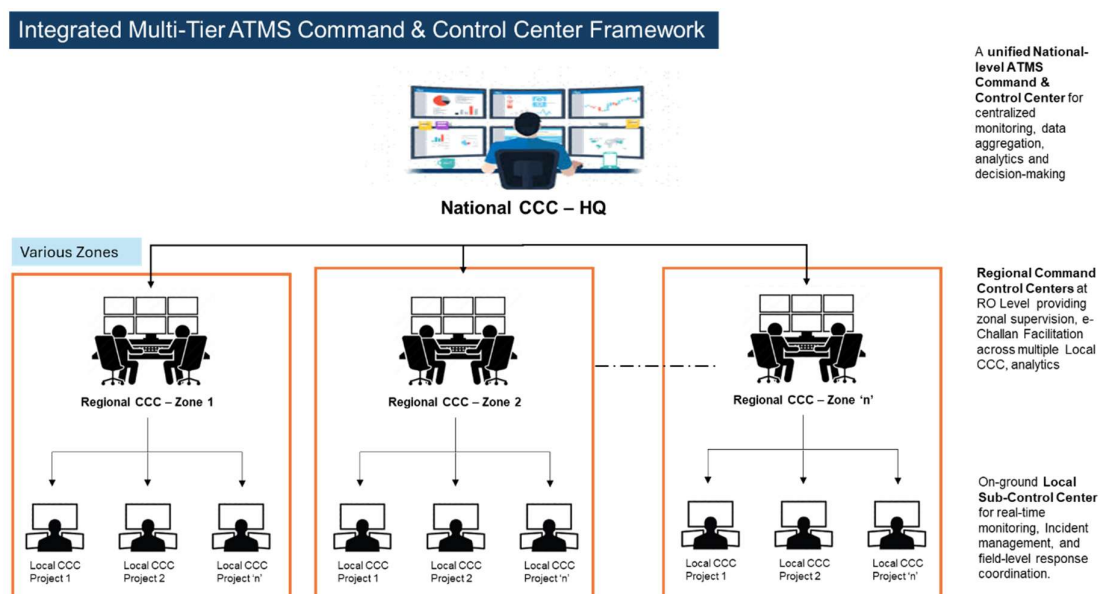
- Video Surveillance System / Traffic Monitoring Camera System (TMCS)
- Video Incident Detection and Enforcement System (VIDES)
- Vehicle Actuated Speed Display System (VASDS)
- Fixed and Portable Variable Message Sign (VMS) System
- Communication Network with OFC Backbone
- ~~Emergency Call-Box~~ **[Deleted]**
- ~~Mobile Radio Communication System~~ **[Deleted]**
- ATMS Command & Control Center (CCC)
- Power Supply for Field Equipment as well as for ATMS Command & Control Center
- Operation & Maintenance (O&M) of the entire ATMS Facility

The entire system should function efficiently as an integrated solution during the entire O&M period.

d. Multi-Tier ATMS Command & Control Framework

The project entails establishing a multi-tier ATMS Command and Control Center (CCC) framework by setting up multiple Local ATMS CCC at the project level, setting up of one Regional Command Centers at the zonal level, and then integrating the regional ATMS CCC with a centralized National ATMS CCC at NHAI headquarters.

This hierarchical architecture is designed to enable seamless coordination and real-time monitoring of traffic conditions and incidents, support effective enforcement integration, and provide a unified platform for centralized, data-driven decision-making across the entire NH Network. The schematic diagram is provided as below:



4. Specifications and Standards

The ATMS Project shall be designed and constructed in conformity with the as per the functional and technical specifications mentioned in **Schedule-C**.

This RFP describes functional requirements envisaged by IHMCL. In addition, the minimum technical specifications have been prescribed in this document, wherever indispensable. The Contractor is responsible for the design of complete project and the system architecture to deliver state-of-the-art solution to IHMCL fully complying to the functional requirement specified in the RFP and site conditions. Any consideration affecting safety, security, redundancy, and compliance to stipulated provision prescribed by Government Authorities is the responsibility of the Contractor and shall be duly taken care of to ensure adherence to minimum functional and technical requirement stipulated in this document as well as the SLA parameters.

5. Scope of Work

5.1. Broad Overview of Scope of work

The ATMS Contractor shall be responsible for the **end-to-end design, supply, installation, testing, commissioning, operation, and maintenance** of the Advanced Traffic Management System (ATMS) on a **turn-key basis** at all specified project locations, including comprehensive 5-year Operation & Maintenance (O&M) services. The system shall be delivered in full compliance with the functional and technical requirements outlined in **Schedule C** and operated and maintained throughout the entire contract period.

Broad overview of scope is as below:

- i. Undertake end-to-end site surveys and feasibility assessments for the deployment of all ATMS components, including finalization of locations for key sub-systems such as the Traffic Monitoring Cameras System (TMCS), Video Incident Detection & Enforcement System (VIDES), Variable Message Signs (VMS), and Vehicle Automatic Speed Detection (VASD).
- ii. Prepare detailed design documents and drawings, including civil structures such as gantry design, etc. in accordance with the specifications outlined in the RFP and as per NHAI Policy Guidelines/Standard Documents/2023, Policy Circular No. 11.53/2023 dated 10 October 2023.
- iii. Procure and supply all required ATMS equipment, materials, spare parts, test instruments, and tools; ensure secure transportation and timely delivery to the designated project sites; and carry out all associated civil works necessary for the erection of poles or gantries, providing robust pole/gantry structures designed to withstand site-specific wind loads and environmental conditions, in accordance with NHAI/MoRTH specified standards
- iv. Carry out testing, commissioning, and trial run of the ATMS systems at the specified project locations, ensuring rectification and closure of all punch-point items identified during Site Acceptance Testing (SAT) and obtaining approval for Go-Live.
- v. Design, implement, integrate, test, commission, and maintain a secure, high-bandwidth OFC-based digital communication system linking all

ATMS tiers—field devices, Local, Regional, and National CCCs—including full-scale ATMS Implementation project and ATMS upgradation with VIDES projects, with responsibilities covering corridor survey, network planning, civil works, equipment supply, feasibility assessments, alternate connectivity where OFC is unfeasible, stakeholder coordination, statutory clearances, and end-to-end operations, maintenance.

- vi. Integrate any other ATMS projects implemented under various PIUs within the Region/Zone, in addition to the ATMS projects specified in Schedule A, with the Regional ATMS Command and Control Centre (CCC) for centralized monitoring of ATMS equipment, live video feeds, and incident/event data. The Bidder shall ensure seamless interoperability, real-time data exchange, and unified monitoring at the Regional ATMS CCC in accordance with the technical requirements, interfaces, and standards specified in the RFP.
- vii. Ensure uninterrupted 24x7 power supply to all ATMS field devices and Command & Control Centres by arranging and maintaining primary electricity connections, UPS, solar or other renewable sources, and DG sets at its own cost, including all applications, approvals, electrical works, protection systems, testing, recurring charges, and alternative arrangements as required, with no financial or operational obligation on IHMCL/NHAI.
- viii. Provide comprehensive 5-year operation and maintenance (O&M) of the ATMS, ensuring 24x7 availability, optimal performance, preventive and corrective maintenance, software and network support, spare parts management, and deployment of dedicated qualified manpower, while adhering to SLA requirements, safety protocols, and timely reporting to maintain uninterrupted and reliable operation of all field and control centre equipment.
- ix. Deployment of ATMS Hardware and Integration with Common ATMS Software

a. Deployment of ATMS Hardware

- i. The Contractor shall be responsible for the supply, installation, testing, commissioning, and maintenance of all ATMS field and control room hardware at the designated project locations, in accordance with the Technical Specifications, Drawings, and Applicable Standards provided in this RFP.
- ii. The scope shall include, but not be limited to:
 - 1. Field devices such as CCTV cameras (Fixed/PTZ), ANPR cameras, Traffic Monitoring Sensors (Radar/LiDAR/Video-based), Variable Message Signs (VMS), Environmental Sensors, and associated mounting structures.
 - 2. Networking equipment including switches, routers, firewalls, media converters, and communication infrastructure.
 - 3. Power supply systems including UPS, cabling, earthing, surge protection, and integration with available raw power supply.
 - 4. Control Room hardware including servers, storage systems, operator workstations, video wall controllers, display panels, and associated peripherals.

5. The Contractor shall ensure that all equipment is installed in accordance with OEM guidelines, relevant IRC/MoRTH specifications, and industry best practices. All hardware shall be interoperable, scalable, and capable of seamless integration with the Common ATMS Software platform.

b. Integration with Common ATMS Software

- i. The Common ATMS Software application shall be provided separately by IHMCL. The Contractor shall ensure complete integration of the deployed hardware components with the said software platform.
- ii. In this regard, the Contractor shall:
 1. Provide all necessary APIs, SDKs, communication protocols, and interface documentation required for integration.
 2. Ensure that field devices support open and standard communication protocols (such as ONVIF, NTCIP, REST APIs, or other standards as specified).
 3. Facilitate configuration, device mapping, health monitoring, event triggering, and data exchange with the Common ATMS Software.
 4. Undertake joint integration testing in coordination with IHMCL and the software provider.
 5. Rectify any hardware-level incompatibility issues identified during integration at no additional cost to the Authority.

c. Interoperability and Compliance

- i. The Contractor shall ensure that:
 1. All deployed devices are compliant with interoperability requirements specified in the RFP.
 2. No proprietary lock-in architecture is introduced that restricts integration with the Common ATMS Software.
 3. Firmware and software versions of field devices are compatible with the centralized application.
 4. Cybersecurity provisions, including secure communication (SSL/TLS), device authentication, and role-based access, are implemented as per prevailing guidelines.

d. Testing and Commissioning

- i. The Contractor shall conduct Factory Acceptance Testing (FAT), Site Acceptance Testing (SAT), and System Integration Testing (SIT) in coordination with IHMCL and the Common ATMS Software provider.
- ii. Final acceptance of the ATMS system shall be subject to:
 1. Successful hardware installation and commissioning,
 2. Seamless data flow and command execution through the Common ATMS Software,
 3. Demonstrated device health monitoring and alert generation,
 4. Compliance with defined Service Level Agreements (SLAs).

e. Responsibility Matrix

- i. For clarity, IHMCL shall provide the Common ATMS Software platform, while the Contractor shall be solely responsible for:
 1. Hardware readiness for integration,
 2. Interface compatibility,
 3. End-to-end functional integration at device level,
 4. Resolution of hardware-originated integration

5.2. Detailed Scope of Work

5.2.1. Detailed Site Survey and Feasibility

Undertake end-to-end site surveys and feasibility assessments for the deployment of all ATMS components, including:

- Finalising locations for key ATMS sub-systems/components such as the Video Incident Detection & Enforcement System (VIDES), Variable Message Signs (VMS), and Vehicle Automatic Speed Detection (VASD) in consultation with concerned PIU/IHMCL team.
- Requirement gathering, identification and recommendation on sites for local ATMS Command & Control Centres in close coordination with the concerned PIU and IHMCL.
- Assessing the availability and adequacy of network connectivity in existing ATMS projects where upgrades with VIDES are planned and recommending necessary enhancements.
- Identifying and proposing suitable mechanisms for establishing reliable connectivity (e.g., fibre, MPLS, or other secure communication links) to support seamless integration

5.2.2. Submission of Technical Design Document

The ATMS Contractor shall prepare comprehensive technical design documents and detailed drawings strictly in line with the specifications outlined in the RFP and in accordance with NHAI Policy Guidelines/Standard Documents/2023, Policy Circular No. 11.53/2023 dated 10 October 2023. The design submission must provide a complete technical solution and system architecture for each ATMS module and shall cover, at a minimum, the following aspects:

- a. Technical Solution Requirements: Tools & Technologies for Each Module, Storage & Database, Data Processing & Analytics, Backend Services, Frontend Applications, etc.
- b. Scalability and Performance: Strategy for horizontal and vertical scaling to handle projected traffic loads, Performance benchmarks, latency targets, and response-time SLAs for each module.
- c. System Architecture for Each Module: present a layered architecture diagram and narrative description for each ATMS module, addressing, API Layer & Integration Frameworks to ensure seamless interoperability across systems, Protocols & Communication Standards (e.g., HTTPS, MQTT, WebSockets) for secure and efficient data exchange, Polling Intervals & Data Refresh Cycles for timely updates, Data Processing & Analytics Pipeline defining data flow from acquisition to actionable insights, Reporting & Visualisation Engine to provide dashboards and

analytical reports, User Interface / User Experience Layer ensuring intuitive and responsive operation, Security & Identity Management covering authentication, authorisation, and end-to-end encryption.

- d. Deployment Strategy and Timeline: Provide a detailed deployment plan and time schedule for completing the entire scope of work, including, phased rollout of each ATMS module with defined milestones, integration testing, user acceptance testing (UAT), and final commissioning.
- e. The ATMS Contractor shall conduct the field survey, preparation of design drawings and supply of ATMS equipment and materials, spare parts, test equipment, tools and materials, factory inspection (inspection of equipment & materials upon delivery), training, transportation and site. delivery, construction and installation, preparation of as-built drawings, testing and commissioning and operation and maintenance of the ATMS system.

5.2.3. Construction of Supporting Civil Infrastructure

- a) The ATMS Contractor shall be fully responsible for all civil works required for the successful deployment of ATMS site components. This includes site clearance, construction of foundations, chambers, etc. and the erection of gantries and poles at the designated locations. The design of gantries and poles shall be approved by IIT or NIT prior to erection. All foundations and structures shall be constructed using appropriate concrete grades and materials in accordance with NHA/MORTH standards for similar works.
- b) The ATMS Contractor shall adopt a uniform and standardized walkable gantry design for installation of ATMS equipment across all project locations. The gantry design shall be finalized in consultation with the NHA Design Cell and other relevant institutes/agencies to ensure consistency in structural design, safety, and aesthetics, and to facilitate ease of approvals. The ATMS Contractor shall also share the finalized gantry design with the concerned civil contractors/authorities, wherever feasible, for incorporation of required foundations and provisions during the highway construction stage to minimize retrofitting and associated costs.
- c) The Contractor shall ensure the structural integrity, stability, and durability of all erected gantries and poles, implement all necessary safety measures during construction and installation, and shall remain solely responsible for the proper erection, alignment, and long-term performance of these structures to withstand site-specific wind loads/pressure, environmental conditions.
- d) Any damage caused to the highway or associated infrastructure during these works must be restored to its original condition at the ATMS Contractor's cost. Any delay in completing the restoration work shall attract a penalty as per the applicable contract provisions.
- e) **Utilization of any Existing Signage Gantries for VIDES/ VASD/ VMS Installation** - During the implementation phase, the feasibility of utilizing existing or proposed signage gantries for installation of the Vehicle Incident Detection and Enforcement System (VIDES), Vehicle Actuated Speed Display System (VASD), and Variable Message Board (VMS) shall be examined and finalized in

consultation with the respective NHAI PIU/IHMCL. Such utilization shall be subject to suitability of site conditions, structural adequacy of the gantry, compliance with prescribed visibility and performance requirements, and adherence to applicable safety standards. The decision of the PIU in this regard shall be final and binding.

In case any existing or proposed signage gantries are utilized for VIDES/ VASD/ VMS installation, the corresponding cost towards supply and installation of such gantries, as provided for in the Contract Price, shall be suitably adjusted.

5.2.4. Supply, Installation, Commissioning & Go-Live

The Contractor shall be responsible for turnkey, end-to-end supply, installation, and commissioning and Go-Live of all ATMS hardware, software, and associated services at the specified locations as below:

- a) Procure and deliver all ATMS equipment, poles/gantries, cables, connectors, junction boxes, and accessories with secure packaging, spares parts, insurance, and timely transportation to the designated sites, obtaining all necessary statutory, regulatory, and site-specific clearances required for delivery and installation.
- b) Install all ATMS components with correct alignment, region settings, and unobstructed PTZ camera coverage; securely mount devices on poles/gantries ensuring visibility, accuracy, weather resistance, and protection against vandalism; and provide smart, weatherproof, vandal- and theft-resistant enclosures and junction boxes with real-time tamper detection, relocating or re-aligning equipment as required during System Acceptance Testing.
- c) Conduct comprehensive pre-commissioning checks, system testing, and trial runs of all ATMS components (TMCS, VIDES, VASD, VMS, cameras, sensors, communication links, and backend integrations) at specified locations to ensure full functionality, performance, and compliance with RFP specifications under actual traffic and environmental conditions.
- d) Perform Site Acceptance Testing (SAT) in coordination with IHMCL/Representatives of IHMCL/NHAI to identify and rectify all deficiencies and punch points, test logs, and certifications for all corrective actions taken. Submit all required documentation, including test reports, as-built drawings, calibration certificates, and commissioning records as part of the handover process.
- e) Obtain formal Go-Live approval from the IHMCL only after successful SAT and trial runs, after closure of all point points, if any.

5.2.5. Power Supply for ATMS field devices and Command & Control Center

- a) The ATMS Contractor shall ensure **24x7 power supply** to all ATMS field equipment and the ATMS Command and Control Centres, including both local and regional CCCs, using electricity from the local Electricity Department as the primary source, supported by UPS, renewable energy sources (e.g., solar), and DG sets of adequate capacity to ensure uninterrupted operation.
- b) There shall be NO obligation of IHMCL or NHAI with regard to

providing power/ electricity supply/connections for testing commissioning, operation & maintenance of any component of the ATMS.

- c) The ATMS Contractor shall carry out all necessary applications and approvals with the Power Company for electricity supply to the field equipment, ATMS CCCs in their own name or IHMCL/NHAI as applicable. All costs associated with such applications, connections, and execution of work shall be borne entirely by the Contractor.
- d) Complete all electrical terminations for ATMS devices, and install all necessary lightning protection, surge protection devices (SPDs), earthing and grounding systems to safeguard equipment against electrical faults and transient over-voltages. The Contractor shall also test and certify the electrical installations for safety, reliability, and seamless integration with the ATMS power and communication systems.
- e) Provide raw and solar-powered connections for all site components as per Schedule C, including panels, enclosures, stands, cabling, conduits, foundations, and all necessary accessories to ensure continuous and reliable operation.
- f) The ATMS Contractor shall make all necessary arrangements to ensure electricity supply for the execution of works and the O&M period for the entire contract duration. In case electricity is unavailable from the power company, the Contractor shall provide alternative arrangements, including renewable energy or DG sets. No extension of time shall be granted by NHAI for milestone achievement due to the Contractor's inability to arrange electricity.
- g) All charges related to power supply, including fixed charges, installation, recurring charges, electricity bills, DG fuel, and maintenance for field equipment, ATMS Control Centre, Contractor's site office, or any other facility used under the contract, shall be borne by the ATMS Contractor for the entire contract period. IHMCL/NHAI shall have no financial or operational responsibility in this regard.
- h) The Contractor shall submit the electrical design for all ATMS components, including electricity load requirements, cabling, distribution boards, and clean earthing systems, ensuring suitability for continuous and reliable operation of all ATMS equipment.

5.2.6. Setting up OFC based Digital Transmission system through 2 x 48 Core

- a) The ATMS Contractor shall design, supply, install, test, commission, and maintain a comprehensive OFC-based digital communication system to provide secure, high-bandwidth, and resilient connectivity across all ATMS tiers. This shall include establishing seamless communication links from the field devices to their respective Local ATMS Command & Control Centres (Local ATMS CCC), from each Local ATMS CCC to the Regional ATMS Command & Control Centres (Regional ATMS CCC), and further from the Regional ATMS CCC to the National ATMS Command & Control Centre (National ATMS CCC) which shall be located in Delhi-NCR.
- b) The Scope shall include the laying of two (02) 48-core OFC cables in accordance with the standards and specifications set forth in Schedule C, preferably along each side of the stretch, so as to

provide connectivity across the highway stretch, service roads, underpasses, entry/exit ramps, and all locations where ATMS field equipment or control facilities are deployed.

c) **OFC Works**

The ATMS Contractor shall be responsible for the complete design, implementation, and maintenance of the Optical Fiber Cable (OFC)-based digital communication system, encompassing the following scope of work:

i. **OFC works shall be carried out by the IP-I licensed companies registered with Department of Telecommunications in terms with Clause 6.17 of the RFP.**

ii. OFC works shall be carried out in accordance with the guidelines and specifications of Department of Telecommunications.

iii. **Network Design and Planning:** The Contractor shall conduct a detailed topographical and utility survey of the entire corridor to finalize the OFC route, including service roads, underpasses, and entry/exit ramps. A robust and scalable OFC network topology shall be designed to ensure redundancy (ring/mesh), future expansion capability, and compliance with uptime and latency requirements for real-time video and data transmission. Detailed engineering drawings and technical specifications shall be prepared for all network layers, including cable routing, duct layouts, manholes, chambers, and termination points.

iv. **Trenching, Ducting & Civil Works:** The Contractor shall execute trenching, duct laying (manual excavation or HDD), manhole construction, and installation of route markers/chamber covers in medians or alternative Right-of-Way (LHS/RHS) as required. Warning/safety tape shall be provided at one foot above ducts prior to backfilling, with proper soil/sand filling and compaction. The Contractor shall coordinate with local utilities and authorities to obtain necessary clearances and right-of-way permissions, as applicable, to avoid service disruptions.

v. **OFC Supply & Laying:**

The Contractor shall procure and lay high-quality feeder and distribution optical fiber cables with appropriate armouring and specifications. Precision splicing, termination, and jointing shall be carried out to meet defined performance parameters. Each OFC segment shall be tested and certified for attenuation, bandwidth, and continuity in line with industry standards. The short haul connections like between field equipment to access points, access points to OFC backbone etc shall be done with minimum 12 Core cable. The OFC shall be laid strictly as per the Standards and Specification given under Schedule-C. ATMS contractor to lay OFC underground at-grade level, and crossing if required under paved surface should be done through HDD without affecting the road surface or any road infrastructure. ATMS Contractor shall be held liable for any damage to the road surface and road infrastructure while

implementing ATMS works. The network devices at the roadside unit shall have the optical bypass facility to avoid the network outage caused by the power failure at that field equipment level.

- vi. **Active Network Equipment:** The Contractor shall supply, configure, and integrate all active and passive components, including termination panels, patch panels, multiplexers, routers, switches, and UPS/power supply systems. All equipment shall be designed for 24/7 operations with redundancy in both power and communication paths.
 - vii. **End-to-End Connectivity:** The Contractor shall establish dedicated OFC links from every ATMS field device (e.g., VIDES, VASD, VMS, ANPR cameras, sensors) to the respective Local Command & Control Centre (CCC). High-availability backbone OFC shall be provided between Local CCCs and their designated Regional CCCs. Secure, high-bandwidth OFC shall be laid and integrated from each Regional CCC to the National CCC in Delhi NCR to enable seamless, real-time data and video transfer.
 - viii. **Integration, Testing & Commissioning:** The Contractor shall integrate the OFC network with all ATMS subsystems and required external interfaces. Comprehensive testing—including OFC integrity, network performance, and end-to-end connectivity—shall be conducted prior to Go-Live.
 - ix. **Network Security:** A robust network monitoring platform shall be implemented for proactive fault detection and performance tracking. Multi-layer network security measures, such as encryption, access controls, and incident response mechanisms, shall be deployed to protect the network against unauthorized access or damage.
 - x. The Contractor shall have complete, end-to-end responsibility for survey, design, procurement, installation, integration, testing, commissioning, and lifecycle maintenance of the entire OFC-based digital communication system to ensure uninterrupted, secure, and scalable connectivity.
- d) Where OFC-based connectivity is found to be unfeasible, the Contractor shall conduct detailed feasibility studies and submit recommendations for alternate connectivity solutions—such as RF, wireless, or other suitable technologies—for prior approval of IHMCL.
- e) In case of ATMS Upgradation projects, the ATMS Contractor shall be fully responsible for establishing OFC-based connectivity to integrate the VIDES component with the existing ATMS Local Control Centres or the toll plazas currently serving as the operational hubs
- i. The ATMS Contractor shall, where the existing OFC infrastructure is found inadequate or absent, design and implement suitable solutions to meet the required communication performance. The Contractor shall provide solutions such as laying new OFC, utilizing available dark fibre, deploying radio frequency (RF) links, MPLS circuits, or adopting

hybrid communication technologies, as necessary.

- ii. The ATMS Contractor shall coordinate with NHAI project stakeholders, including EPC/HAM/BOT/TOT concessionaires, utility agencies, and local authorities, to ensure smooth execution of all network-related activities, while carrying out all works with minimal disruption to highway operations and in full compliance with applicable statutory and safety requirements.
- iii. The ATMS Contractor shall ensure uninterrupted connectivity to all VIDES installations within the upgraded ATMS network, accept full responsibility for any downtime attributable to communication or network disruptions as a service-level breach subject to applicable SLA penalties, and provide continuous operations and maintenance support, including proactive monitoring, fault diagnosis, and prompt rectification throughout the contract period.

5.2.7. Setting up of Local ATMS Control Center and Regional ATMS Command & Control Center

5.2.7.1. Local ATMS Control Centre

- a) The Contractor shall setup Local ATMS Control Center at judicious locations preferably every 75 to 100 Km distance.
- b) All the Local ATMS Control Center should be connected to the stretches under its jurisdiction as well as to the Regional ATMS Command & Control Centre through suitable network architecture as defined in RFP.
- c) For establishing Local Control Centres, the Contractor can use existing Toll Plaza buildings, ATMS Control Centre available in the project stretch. In case Local Control Centre space is not available at a desired location, the Contractor shall establish the Local Control Centre in Porta Cabin/ Containers of suitable size as per provisions of Schedule C. For avoidance of doubt, the Contractor shall establish such Control Centre at their own cost.

5.2.7.2. For Regional ATMS Command and Control Centre

The ATMS Contractor shall be provided a space in Delhi NCR as specified in Schedule A for setting up of Regional ATMS CCC, The Contractor shall be responsible for interior works, MEP works, etc. for construction and setting up the ATMS Control Centre, including any related electrical, lighting, generator set (preferably eco-friendly Gas powered), power backup, HVAC works, access control, air conditioning, CCTV, PTZ cameras, firefighting, alarm, extinguishers, etc. shall be in the scope of the Contractor. All operational expenses towards electricity, diesel/fuel, and other consumables shall be in the scope of the ATMS Contractor.

- 5.2.7.3. The Contractor shall be responsible for interior works, MEP works, etc. for construction and setting up the ATMS Control Centre, including any related electrical, lighting, generator set (preferably eco-friendly Gas powered), power backup, HVAC works, access control, air conditioning, CCTV, PTZ cameras, firefighting, alarm, extinguishers, etc. shall be in the scope of the Contractor. All operational expenses towards electricity, diesel/fuel, and other consumables shall be in the scope of the ATMS Contractor

- 5.2.7.4. ATMS Contractor shall provide dedicated workstation for the usage of

representatives of Traffic Police or other Enforcement Agency at the Command and Control Centres for verification/ validation of violations, e-challans etc.

- 5.2.7.5. The ATMS Contractor shall be responsible for the seamless integration of the ATMS Common Control Centers (CCC) with the e-challan system, coordinating effectively with various enforcement agencies and the National Informatics Centre (NIC) to facilitate automated e-challan issuance and processing. This includes ensuring data interoperability, real-time information sharing, and compliance with applicable interfaces and protocols as per project requirements.

5.2.7.6. Connectivity between Local ATMS Control Centres and Regional ATMS CCC

- a) The Contractor shall design, provide, operate, and maintain a secure, reliable, and scalable connectivity architecture to ensure seamless and real-time communication between all Local ATMS Control Centers and the Regional ATMS Command and Control Centre. The Contractor shall map the owned OFC, and any additional requirement of fiber, electronic hardware, transport equipment, etc., shall be undertaken by the ATMS Contractor.
- b) The connectivity framework shall include both primary and secondary (redundant) communication links as per feasibility, using appropriate technologies such as owned OFC networks, MPLS, VPN, leased lines, utilisation of available dark fibre, radio frequency (RF) links, wireless systems, or any hybrid combination thereof, as required to meet performance and reliability standards.
- c) The proposed architecture must ensure high availability, minimal downtime, adequate bandwidth, and low latency, along with robust cybersecurity measures for secure transmission of all system data.
- d) Further, the connectivity shall support uninterrupted transmission of live video feeds, incident and traffic data, alerts, AI-based analytics outputs, e-challan information, voice communication, and system logs between Local Control Centre and Regional ATMS Command and Control Centers. The Bidder shall utilise the existing OFC connectivity to the extent possible.
- e) The ATMS Contractor shall, to the extent feasible, lay the OFC within the Right of Way (RoW), preferably along the median, subject to site conditions and statutory provisions. The alignment and methodology for OFC laying shall be carefully planned and executed so as to minimise the risk of accidental damage, fibre cuts, and service disruptions during both implementation and the operation & maintenance period. The Contractor shall adopt appropriate protection measures, including but not limited to maintaining adequate trenching depth, provision of HDPE ducts, installation of route markers, and suitable protective structures at vulnerable locations. The Contractor shall be solely responsible for ensuring the integrity, safety, and uninterrupted performance of the OFC network throughout the Contract Period.

5.2.8. Operations & Maintenance

The ATMS Contractor shall be responsible for the comprehensive operation and maintenance of the ATMS for a period of **five years**, ensuring 24x7 availability and optimal performance of all system components, including field

equipment and Command & Control Centre systems.

A. Scope of Services

The scope of Services under O&M period are as below:

- i. The Contractor shall provide on-site support, adhere to all safety requirements, manage tools and spare parts, maintain vehicles for prompt service response, and comply with all Service Level Agreement (SLA) parameters.
- ii. The scope of O&M shall include deployment of dedicated, qualified, and experienced manpower. An Aadhaar biometric attendance system shall be implemented for all personnel, with monthly system-generated reports submitted to the Authority, and any changes in manpower shall be reported in advance.
- iii. The Contractor shall provide on-site support, adhere to all safety requirements, manage tools and spare parts, maintain vehicles for prompt service response, and comply with all Service Level Agreement (SLA) parameters.
- iv. Maintenance functions shall cover scheduled/routine maintenance to ensure reliability, extended equipment life, and efficient system operation; breakdown or corrective maintenance for repair of minor or major faults; periodic software upgrades; calibration of relevant equipment; software, data, and network support services; technical and engineering support; and supply and management of spare parts to meet SLA requirements.
- v. Routine maintenance activities shall include inspections, measurements, cleaning, lubrication, verification of voltage levels, system integrity checks, and prompt rectification of defects, following manufacturer specifications and agreed maintenance schedules.
- vi. The Contractor shall provide monthly performance reports, summarize rectification of notified issues, and notify operations teams in advance of planned maintenance to ensure minimal disruption to highway operations.
- vii. The Contractor shall ensure the ATMS system operates continuously as intended, enabling timely monitoring of highway incidents and uninterrupted provision of essential services to commuters, while maintaining all system components and infrastructure in a fully operational condition throughout the contract period.
- viii. Before the start of O&M Period, the Contractor shall deploy the O&M Personnel mentioned in this RFP with prior approval of the Authority. The resumes of the proposed personal shall be submitted in the format as specified by IHMCL.
- ix. The Successful Bidder shall ensure that no manpower is deployed at the Command-and-Control Centre without completion of background verification including police verification. The Bidder shall maintain proper records of all background checks and submit the same to the Authority upon request.

B. Manpower Requirement:

The minimum manpower requirement for various ATMS Project shall be as below:

a. For Local ATMS Control Centre –

- i. The minimum manpower requirement shall be as per requirement provided below:

SI #	Position	No of Personnel	Minimum Educational Qualification	Minimum Experience
1.	ATMS Incident Manager	1 (in general shift)	MCA or Graduate in Engineering	At least 5 years' experience in similar field
2.	OFC/Network Technician	2 per shift	Diploma in Electronics & Tele-communication/ IT/ Computer Science/ Electrical & Electronics/ Instrumentation	At least 2 years' experience in similar field
3.	Incident Operations Staff	2 per shift	Graduate (preferably science)	0–1 year experience in similar field

- ii. The manpower requirement mentioned above are minimum, the Bidder shall deploy sufficient manpower for maintenance of ATMS equipments across all the projects.

b. For Regional ATMS CCC - The Regional ATMS CCC shall be housed with following minimum manpower:

SI #	Position	No of Personnel	Minimum Educational Qualification	Minimum Experience
1	ICCC Manager	1 person in general shift	MCA or Graduate in Engineering	At least 8 years' experience in similar field
2	IoT/ Network Engineer	2 persons in general shift	BE/B Tech in Electronics / IT or similar field	At least 2 years' experience in similar field
3	AI Analytics & Applications Engineer	3 persons in general shift	MCA or Graduate in Engineering	At least 3 years' experience in similar field
4	ICCC Operators	2 persons per shifts	Graduate (preferably science)	0–1 year experience in similar field

Note: Any increase in manpower requirements at the Regional ATMS Common Control Center shall be provisioned in accordance with project needs and accounted for at the agreed-upon unit rate.

- i. Broad Roles and Responsibilities of above resources are as below:
 - a. ICCC Manager: Overall in charge of Regional ATMS Command and Control Centre operations, responsible for coordination with the Authority and State enforcement agencies, monitoring system performance, ensuring compliance with approved SOPs, overseeing incident management and reporting, and reporting to the concerned PIU/RO, and other concerned authorities
 - b. IoT/Network Engineer: Shall be responsible for operation, monitoring, and maintenance of network, communication, and IoT infrastructure, including connectivity between Local ATMS CCs and the Regional ATMS CCC, field devices, data transmission systems, cybersecurity coordination, and overall system uptime.
 - c. AI Analytics & Applications Engineer: Shall be responsible for management and optimization of AI-based analyses of traffic and incident data, including application/ equipment performance and generation of actionable insights and reports.
 - d. ICCC Operators: Shall be responsible for round-the-clock monitoring of various ATMS systems, facilitation of enforcement and e-challan processing including validation of image evidence and incident logging, coordination with Local ATMS CCs, field teams, and State agencies, and timely escalation as per approved SOPs.

C. Vehicles for ATMS Control Centers:

- i. The Contractor shall deploy minimum 2 maintenance vehicles at each Local Control Centre to attend the maintenance requirement during the Operation & Maintenance period for the entire ATMS project stretch Maintenance Vehicle shall be compliant with Route Patrol Vehicle Mentioned in NHAI Policy No. Policy Circular No. 12.36/2024 dated 12th December 2024 or as amended from time to time.
- ii. The Contractor shall deploy a SUV (minimum 2100 cc) vehicle for Regional ATMS CCC for day-to-day project requirement.

D. Data Archiving

- i. The Contractor shall establish and implement a comprehensive data archiving framework for ATMS as per NHAI/IHMCL guidelines, including classification and segregation of incident data and image/video data, with defined retention periods based on regulatory, evidentiary, and operational requirements. All archived data shall be secured against tampering through appropriate mechanisms such as encryption, hashing, and access controls, with strict role-based access and audit trails. The system shall ensure scalability, efficient indexing, and timely retrieval of data, along with robust backup and disaster recovery provisions. Data archiving practices shall comply with applicable laws and standards, ensure interoperability with external systems, and include lifecycle management with secure disposal of expired data, while preserving critical incident data for entire Contract Duration.

- ii. Data Recording and Archival: Image/ Video streams from individual cameras shall be recorded on respective NVRs/Camera Servers and subsequently archived to centralized storage systems such as NAS/RAID backup devices. All data, including video, audio, and system logs collected from various ATMS components, shall be archived in the ATMS servers to enable quick and efficient retrieval by authorized personnel. The archival and retrieval processes shall be designed such that they do not adversely impact the performance or response time of the ATMS software.
- iii. Data Backup, Export, and Audit: The system shall support archival of historical data, including call records and logs, onto external media such as Tapes, HDD, or RAID backup devices, as required. All such archival, backup, and data export activities shall be properly logged, with detailed audit trails maintained to ensure traceability and accountability.
- iv. Access Control and Data Management Tools: All workstations shall be equipped with necessary software tools for playback, archiving, and management of recorded data, including video and call records. Appropriate role-based access controls shall be implemented, ensuring that only authorized personnel, including designated managers, have sufficient rights to access, playback, and archive such data.
- E. The System shall store all camera recordings (TMCS/VIDES/Command Centre CCTV etc) for a period of 7 days at Local Control Centre and 30 days at Regional ATMS Command and Control Centre or until SLAs have been assessed for that period, whichever is later.

The System shall have provision for recording of image/video streams on NVRs/Camera Servers, with archival on centralized storage (Tape/NAS/RAID), ensuring efficient retrieval without any impact on system performance. The System shall have provision for data backup, export to external media, audit trails, and disaster recovery mechanisms. Role-based access control, along with necessary tools for playback, archiving, and data management at designated workstations, shall also be provided as part of the System.

5.2.9. Others

- a) The Contractor shall propose the ATMS solution and equipment to fully meet the functional requirements of this RFP. The quantity and the technical specification of the equipment shall be proposed by the Contractor for each ATMS sub-system, unless until specified in this RFP, such that each sub-system fully meets the functional requirement as per the site conditions and SLA requirements.
- b) The Bidder shall quote for the entire system and facilities on a "single responsibility" basis such that the Contract Price covers all Contractor's obligations mentioned in or to be reasonably inferred from the Contract Documents in respect of the design, manufacture, procurement, construction, installation, adjustment and testing of the Works and remedying

any defect therein and operation and maintenance of entire setup for the contract duration. This includes all requirements under the Contractor's responsibilities for testing and commissioning of the systems and facilities, and where required by the Contract Documents, the acquisition of all permits, approvals and license, etc.; the training services and such other items and services as may be specified in the Contract Documents.

- c) The requirements stated herein shall be construed as minimum requirement and meeting the respective requirements shall not relieve the Contractor from the responsibility of supplying the ATMS that functions efficiently as a system and carry out its Operation & Maintenance for the entire Contract Period.
- d) The Contractor shall be responsible for Integration of ATMS system and sub-systems with the NHAI Mobile apps for the road users as per the requirement raised from time to time by NHAI or its authorized agency.
- e) The Contractor shall also undertake the works that are not specifically mentioned in this RFP but essential for the efficient implementation and operations of the ATMS to meet the functional requirements specified in the RFP.
- f) The Contractor shall be responsible for Integration of ATMS system and sub-systems with the NHAI Central Command Centre and ATMS systems of other projects as per the requirement raised from time to time by NHAI or its authorized agency. Additionally, the ATMS Solution shall include provision of IP/API based feed to enforcement agencies as per the requirements raised from time to time by NHAI or its authorized agency.
- g) The Contractor shall be responsible for integration of ATMS system with 1033, Vahan Database, Police Control Rooms, Dial 112, and others as per the requirement raised from time to time by NHAI or its authorized agency (NHA will facilitate Contractor by writing letters to external agencies for integration / sharing API, as applicable, on written request of the Contractor and recommendations of the ITS Engineer). All technical coordination will have to be carried out by the Bidder at its own cost.
- h) Growth and maturity levels – the proposed system shall be capable of meeting the requirements arising due to the increase in traffic in the coming years without any additional cost implication to NHAI.
- i) The ATMS Software shall perform health monitoring check of all field equipments and generate an equipment downtime report based on the same as per provision of Schedule C.
- j) In addition to the above requirements the ATMS Solution should include all the functional and technical requirements mentioned in schedule C.
- k) The Contractor shall have sufficient infrastructure and capability to keep/store spares required for maintenances and will at all times during the contract period maintain sufficient inventory of spares and consumables for operating and maintaining the ATMS and to meet the Service Level Agreement.
- l) **Standard Operating Procedure ("SOP"):** The ATMS Contractor shall design a detailed SOP Manual listing all the steps that need to be undertaken by the personnel in the Command Centre and the on-road units for all incident types and sub-types. The SOP Manual needs to be submitted to NHAI and/or its representative for review and approval. The schedule C has

listed high-level standard operating procedure envisaged for management of all incidents. Time to time ATMS contractor based upon the need and experience may suggest the amendments for the SOP and seeks the approval of authorities.

In case GNSS-based Electronic Toll Collection (ETC) is implemented in future, the VIDES solution shall be incorporated to support validation and dispute resolution. VIDES will provide stationary validation by allowing queries of vehicle passage data at VIDES locations along the project stretch for the past 30 days. The ATMS Contractor must develop a common REST-based web API with 98% uptime and strict access controls, enabling authorized NHAI personnel to retrieve all instances of a vehicle registration number (VRN). Each record will include the ANPR camera image showing the VRN, overview camera image, timestamp, VIDES gantry location coordinates, and an on-demand 5-second video clip from the overview camera. Video will be stored as continuous footage, with the system automatically extracting requested clips in real-time (within 60 seconds) or asynchronously (within 30 minutes). Detailed API specifications will be provided by IHMCL. This ensures efficient enforcement support and dispute resolution for GNSS-based tolling.

5.2.10. Common ATMS Software Integration

- i. IHMCL is in the process of developing a centralized and standardized Common ATMS Software platform for deployment across ATMS projects in India, with the objective of enabling centralized monitoring, interoperability, standardized data formats, unified reporting, analytics, incident management, and seamless integration of ATMS field and backend systems.
- ii. Accordingly, the Successful Bidder shall design, develop, supply, configure, and implement all ATMS equipment, subsystems, applications, databases, communication interfaces, and associated software under this Contract in an open, interoperable, and integration-ready architecture. The deployed system shall support standard industry protocols, APIs, and data exchange mechanisms to facilitate future integration with the Common ATMS Software.
- iii. Upon notification by IHMCL regarding deployment of the Common ATMS Software, the Successful Bidder shall, without any additional cost to IHMCL, integrate all ATMS equipment, applications, and subsystems deployed under this Contract with the Common ATMS Software. The Successful Bidder shall provide all necessary APIs, middleware, SDKs, documentation, technical support, software/firmware updates, and interface developments required for seamless integration and interoperability without affecting ongoing ATMS operations.
- iv. Till such time the Common ATMS Software is developed and deployed by IHMCL, the Successful Bidder shall deploy, operate, maintain, and support its own proprietary ATMS Software compliant with the requirements, SLAs, performance standards, and cybersecurity provisions of this RFP. Post integration with the Common ATMS Software, the proprietary ATMS Software deployed by the Successful Bidder shall be discontinued; however, the Successful Bidder shall continue to provide necessary technical support and coordination during the Operation & Maintenance period to ensure uninterrupted interoperability and smooth

functioning of the integrated ecosystem.

6. Network Management Software

- i. The Network Monitoring System (NMS) should be capable of monitoring all network devices within the System. It shall support IoT/SNMP protocols for capturing health and performance data and provide a web-based interface accessible via a public IP/domain for remote monitoring. For ATMS upgradation projects, the NMS shall also monitor all existing ATMS equipment deployed along the stretch and generate necessary reports.
- ii. The NMS shall include a configurable dashboard with widgets for device status and health, auto-discovery and management features, and a network map (fixed or GIS-based) with color-coded indicators. It shall also provide fault and downtime management screens, SLA reporting with viewable reports, configurable alerts (sound, visual, email), and automated downtime calculations based on device connectivity status.
- iii. At a minimum, the NMS shall capture: (i) for servers/LPUs/workstations – OS-level integration, hardware and performance metrics, network communication, and availability; (ii) for network switches – port usage and device availability; (iii) for firewalls – speed, connections, and blocked traffic; (iv) for cameras – availability, CPU usage, fps, storage, bit rate, and serial details; and (v) for non-SNMP devices – connection status, availability, ping response, and packet loss.

7. Cyber Security and Data Ownership

7.1. Cyber Security Framework

The Contractor shall implement and maintain a comprehensive Cyber Security Framework to ensure the integrity, confidentiality, and availability of all ATMS systems, software, networks, and data assets. The framework shall conform to the latest CERT-In/MeitY advisories, ISO/IEC 27001:2022, and the Digital Personal Data Protection Act, 2023.

7.2. Core Security Controls

The Contractor shall deploy the following minimum controls:

- a. Network & System Security: Multi-layered protection including firewalls, IDS/IPS, endpoint security, and 24x7 SOC-based monitoring.
- b. Access Management: Role-Based Access Control (RBAC), Multi-Factor Authentication (MFA), and periodic access audits.
- c. Data Encryption: Encryption of data at rest and in transit using standards such as AES-256 and TLS 1.3 or higher.
- d. Vulnerability Management: Regular vulnerability assessments, penetration testing, and patch compliance as per CERT-In guidelines.
- e. Incident Response: Documented plan covering detection, escalation, and reporting to IHMCL within six (6) hours of any breach or incident.
- f. System Hardening: Secure baseline configurations for all servers and network components.

7.3. Data Protection and Privacy

All data generated or processed under the Project—including video feeds, incident logs, and analytical outputs—shall be treated as confidential and protected in line with applicable Indian laws. The Contractor shall:

- a. Store and process all data within India as per MeitY guidelines as issued from time to time
- b. Maintain secure backup and disaster-recovery arrangements; and
- c. Apply anonymisation/masking where required to protect personal information, as applicable

7.4. Data Ownership and Intellectual Property

All data, reports, configurations, source codes, and outputs created under this Contract shall remain the exclusive property of IHMCL. The Contractor shall neither retain nor share such data except as authorized. Upon completion or termination, all project data, credentials, and documentation shall be handed over to IHMCL, and all copies shall be permanently deleted with written confirmation.

7.5. Audit and Compliance

IHMCL may conduct or authorize independent security or data-protection audits at any stage. The Contractor shall provide full access and promptly implement any corrective measures directed by IHMCL.

7.6. Liability

Any data breach, unauthorized disclosure, or cyber-security lapse shall constitute a material breach of contract and attract penalties and legal action. The Contractor shall bear full liability for losses or damages arising from such incidents.

8. Equipment site plan / Indicative Equipment Location:

The ATMS Contractor shall conduct a comprehensive site survey and propose precise locations for ATMS sub-systems. The finalization of locations for various ATMS sub-systems and the Local ATMS Common Control Center (CCC) shall be done by the Contractor in close consultation with IHMCL. These finalized locations must be included as part of the design deliverables, accurately marked in the KMZ file corresponding to the project highway.

8.1. Indicative number of Location for Various ATMS Sub-components

The following indicative list outlines the quantities of various sub-components for different ATMS projects. This list serves as the foundation for preparing the detailed bill of quantities for all ATMS sub-systems to be deployed. Indicative Location details of various ATMS sub-Components

a) Summary of Quantities of all Sub-system

i. Full-scale ATMS Implementation

S. No.	PIU	Full ATMS Implementation (in Km) Approx.
1	Rewari	77
2	Meerut	37
3	Baghpat	252
4	Bhiwani	43
	Grand Total	408

ii. ATMS Upgradation with VIDES

S. No.	PIU	ATMS Upgradation with VIDES (in Km) Approx
1	Rewari	190
2	Mathura	59
3	Ghaziabad	113
4	Meerut	193
5	Baghpat	78
6	Bhiwani	163
	Grand Total	797

b) Detailed Project-wise Location

1. Full-scale ATMS Implementation

SL #	PIU	Name of Projects	Lane	Length (in Km) in km	TMCS (in no.)	VIDES (in no.)	VASD (in no.)	VMS (in no.)
1	Meerut	Muzaffarnagar-Miranpur section of NH-709AD		26	32	6	4	2
2	Meerut	Spur to Muzaffarnagar project		11	14	4	2	2
3	Rewari	Six laning & strengthening of NH-248A from Existing Km 2+740 (Rajiv Chowk) to Km 11+682 in Gurugram on HAM in the state of Haryana (Package-I).		9	11	2	2	2
4	Rewari	Delhi-Gurgaon-Kotputli NH-48		63	76	14	8	2
5	Rewari	Dharuhera-Bhiwadi Link Road		5	6	2	2	2

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6	Baghpat	4L PS of EPE Crossing to start of Shamli Bypass from Km. 92.20 to Km. 155.025 of existing NH-709-B		61	74	14	8	2
7	Baghpat	2L of HR/UP Border - Baghpat - Meerut from km. 0.00 to km. 41.36 & from km. 45.84 to km. 48.26		44	53	10	6	2
8	Baghpat	4L PS of Meerut to after Bridge over River Yamuna, Haryana via Shamli-from km. 0.00 to km. 88.476 of NH-709A		84	101	18	10	2
9	Baghpat	Shamli Byapss-Saharanpur from km 92.2 to km 155.025		63	76	14	8	2
10	Bhiwani	4L Ismailabad-Ambala NH-152		43	51	10	6	2
Total				408	494	94	56	20

2. ATMS Upgradation with VIDES

SL #	PIU	Name of Projects	Lane Length (in Km)	TMCS	VIDES	VASD	VMS
			in km	(in no.)	(in no.)	(in no.)	(in no.)
1	Ghaziabad	Delhi Meerut Expressway (NE-3) PKG-1	8	0	2	0	0
2	Ghaziabad	Delhi Meerut Expressway (NE-3) PKG-2	19	0	4	0	0
3	Ghaziabad	Delhi Meerut Expressway (NE-3) PKG-3	22	0	6	0	0
4	Ghaziabad	Delhi Meerut Expressway (NE-3) PKG-4	32	0	8	0	0
5	Ghaziabad	Delhi-Saharanpur (NH 709B) PKG-1	15	0	4	0	0
6	Ghaziabad	Delhi-Saharanpur (NH 709B) PKG-2	17	0	4	0	0
7	Meerut	Western UP Tollway Private Limited, Operations and Maintenance of NH-58 from km. 52+250 to km. 130+560 Meerut – Muzaffarnagar section in the state of Uttar Pradesh	78	0	16	0	0
8	Meerut	Four-Laning of Meerut-Bulandshahar section of NH-235 from Km 8.800 (Design chainage Km 8.800) to Km 66.482 (Design chainage Km 73.512) in the state of Uttar Pradesh on Hybrid Annuity Mode	61	0	14	0	0
9	Meerut	Meerut-Najibabad section of NH-119	54	0	12	0	0
10	Rewari	Six laning & Strengthening of NH-248A from existing km. 11.682 to km. 24.400 (Design Ch. Km. 9.282 to km. 22.000) under NHDP phase IV in the state of Haryana on Hybrid Annuity Mode(Package-II)	13	0	4	0	0
11	Rewari	Construction of the proposed Panyala mode Narnaul to Dhani Bathoda and Section of NH-11 from km 12.00 to km 31.00 as an Economic Corridor & Feeder route in the state of Haryana on “Hybrid Annuity Mode”	46	0	10	0	0
12	Rewari	Construction of the proposed Narnaul Bypass and Ateli Mandi to Narnaul Section of NH-11 from km 43.445 to km 56.900 as an Economic Corridor & Feeder route in the state of Haryana on “Hybrid Annuity Mode”	41	0	10	0	0
13	Rewari	Upgradation of Rewari-Ateli Mandi section of NH-11 from Ex. km 11.780 at Rewari to Ex. Km 43.445 at Ateli Mandi (designed length 31.000 Km) as feeder route in the State of Haryana on “Hybrid Annuity Mode”	30	0	8	0	0

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SL #	PIU	Name of Projects	Lane Length (in Km)	TMCS	VIDES	VASD	VMS
			in km	(in no.)	(in no.)	(in no.)	(in no.)
14	Rewari	Construction of Proposed Rewari Bypass (Designed Length 14.4 Km.) as Feeder route in the State of Haryana on Hybrid Annuity Mode:	14	0	4	0	0
15	Rewari	4/6 laning of Narnaul Bypass Crossing to Paniyala Mor (NH-148B) (at NH-48 Junction) = 31.24 Km, Nizampur Link Road=2.76 Km & Narnaul Bypass Crossing to Pachari Kalan=11.30 Km (NH-11) in the State of Haryana under Bharatmala Pariyojana on Hybrid Annuity Mode (HAM)	45	0	10	0	0
16	Mathura	Construction of Six lane access control Highway from DND Maharani Bagh to Junction with Jaitpur-Pushta Road Section of NH-148NA (Design Ch.0.000 to 9.000 in the National Capital Territory of Delhi on Hybrid Annuity Mode (HAM) under Bharatmala Pariyojana (NHAI/BM/DND-KMP/NH-148NA/IE-I)	9	0	2	0	0
17	Mathura	Construction of Six Lane access-controlled Highway from Junction with Jaitpur-Pushta Road to Junction with Sector 62/65 dividing road on Faridabad – Ballabhgarh Bypass Section of NH-148NA (Design Ch. 09+000 to 33+000) including spur from Design Ch. 13+200 to Junction of Faridabad -Ballabhgarh Bypass with NH-19 near Badarpur Border in the state of Haryana on Hybrid Annuity Mode under Bharatmala Pariyojana	24	0	6	0	0
18	Mathura	Construction of Six Lane access-controlled Highway from Junction with Sector-62/65 dividing road on Faridabad - Ballabhgarh Bypass to Junction near KMP Expressway with NH-148N (Delhi-Vadodara Expressway) Section of NH-148NA (Design Ch. 33+000 to 59+063) Pkg-III in state of Haryana on Hybrid Annuity Mode under Bharatmala Pariyojana	26	0	6	0	0
19	Baghpat	Panipat – Shamli	36	0	8	0	0

RFP for Design, Supply, Installation, Testing, Commissioning and O&M of ATMS
projects in Zone-Delhi NCR on EPC mode

SL #	PIU	Name of Projects	Lane Length (in Km)	TMCS	VIDES	VASD	VMS
			in km	(in no.)	(in no.)	(in no.)	(in no.)
20	Baghpat	Shamli – Muzzafarnagar	43	0	10	0	0
21	Bhiwani	Delhi-Amritsar-Katra PKG 3	31	0	8	0	0
22	Bhiwani	Delhi-Amritsar-Katra PKG 4	29	0	6	0	0
23	Bhiwani	Delhi-Amritsar-Katra PKG 5	38	0	8	0	0
24	Bhiwani	Jalbehra-Shahbad NH152G	23	0	6	0	0
25	Bhiwani	Bhiwani-Hansi NH 148B	43	0	10	0	0
Total			797	0	186	0	0

Schedule-C – Standards & Specifications

The Contractor shall comply with the Specifications and Standards set forth in Annex-I of this Schedule-C for the ATMS Project.

ADDENDUM TO SCHEDULE – C

The following Addendum is issued for Schedule C:

Sl. No.	Section	Existing Clause in Schedule C	Clause to be read as
1.	Chapter 5, Vehicle Actuated Speed Display, Section 5.3, Point 6	c. Minimum Monitored section length: 500 m	c. Minimum Monitored length shall be 90 meter or better
2.	Chapter 5, Vehicle Actuated Speed Display, Section 5.4, Point 6	Shall maintain time stamped record (speed and vehicle image) of each case of over speeding in a log file that can be retrieved over the connected network or using a locally connected laptop.	Shall maintain time stamped record of each case of over speeding in a log file that can be retrieved over the connected network or using a locally connected laptop.
3.	Chapter 4, Video Based Incident Detection and Enforcement Systems, Clause 4.3.1 point (b)	b. Overview Camera (wide range with 60-100m viewing) with IR or Thermal or other Night Vision Mechanism for 60-100m range.	b. Overview Camera (wide range with 60-100m viewing) with IR or Thermal or other Night Vision Mechanism for 60-100m range. Additional camera(s) par with the specifications of overview camera may be added for viewing from side for ATCC purposes.
4.	Chapter 4, Video Based Incident Detection and Enforcement Systems, Clause 4.3.3.4, ATCC	<p>1, The ANPR Cameras monitoring every lane shall be use for Automatic Traffic Counting and Classification</p> <p>2. Each Vehicle Passing from under the Gantry shall be recorded by the ANPR camera. The same will be used to classify the vehicle that is passing.</p> <p>7. The ATMS software shall also identify vehicles whose Class as identified by the camera visually don't match the class returned from the NPCI FASTag mapper API. These violations shall be passed on PD or IHMCL for further action.</p>	<p>1. The VIDES cameras in combination or otherwise, shall be used for visual Automatic Traffic Counting and Classification.</p> <p>2. Each Vehicle Passing from under the Gantry shall be recorded by the ANPR camera.-</p> <p>7. The ATMS software shall also identify vehicles whose Class as identified by the camera visually don't match the class returned from the NPCI FASTag mapper API. These violations shall be passed on PD or IHMCL for further action along with photographs and other evidence.</p>

RFP for Design, Supply, Installation, Testing, Commissioning and O&M of ATMS
projects in Zone-Delhi NCR on EPC mode

Sl. No.	Section	Existing Clause in Schedule C	Clause to be read as												
5.	Chapter 4, Video Based Incident Detection and Enforcement Systems, Point 2	<div>Clause 4.4. Video Camera</div> <table><tr><td>b.</td><td>Imager</td><td>Interline transfer 1/3” format CMOS</td></tr><tr><td>f.</td><td>Minimum Illumination</td><td>0.15 Lux (F1.2, AGC On) at 50m IRE</td></tr></table> <div>(Overview)</div>	b.	Imager	Interline transfer 1/3” format CMOS	f.	Minimum Illumination	0.15 Lux (F1.2, AGC On) at 50m IRE	<div>Clause 4.4. Video Camera (Overview and Sideview)</div> <table><tr><td>b.</td><td>Imager</td><td>1/3” format CMOS</td></tr><tr><td>f.</td><td>Minimum Illumination</td><td>0.15 Lux (F1.2, AGC On) at 100 m IRE</td></tr></table>	b.	Imager	1/3” format CMOS	f.	Minimum Illumination	0.15 Lux (F1.2, AGC On) at 100 m IRE
b.	Imager	Interline transfer 1/3” format CMOS													
f.	Minimum Illumination	0.15 Lux (F1.2, AGC On) at 50m IRE													
b.	Imager	1/3” format CMOS													
f.	Minimum Illumination	0.15 Lux (F1.2, AGC On) at 100 m IRE													
6.	Chapter 4, Video Based Incident Detection and Enforcement Systems, Clause 4.5. ANPR Camera, Point 12	<table><tr><td>b.</td><td>Imager</td><td>Interline transfer 1/3” format CMOS with Full HD with Global Shutter</td></tr></table>	b.	Imager	Interline transfer 1/3” format CMOS with Full HD with Global Shutter	<table><tr><td>b.</td><td>Imager</td><td>1/3” format CMOS with Full HD with Global Shutter</td></tr></table>	b.	Imager	1/3” format CMOS with Full HD with Global Shutter						
b.	Imager	Interline transfer 1/3” format CMOS with Full HD with Global Shutter													
b.	Imager	1/3” format CMOS with Full HD with Global Shutter													
7.	Appendix C - ATMS Control Centre Organization and Staffing, Clause 1.1. The Organization.	<table><tr><td>No</td><td>Role / Position</td><td>No of Personnel</td></tr><tr><td>4</td><td>Incident Operations Staff</td><td>1 per 5 VIDS per system</td></tr></table>	No	Role / Position	No of Personnel	4	Incident Operations Staff	1 per 5 VIDS per system	<table><tr><td>No</td><td>Role / Position</td><td>No of Personnel</td></tr><tr><td>4</td><td>Incident Operations Staff</td><td>1 per 5 VIDS per shift</td></tr></table>	No	Role / Position	No of Personnel	4	Incident Operations Staff	1 per 5 VIDS per shift
No	Role / Position	No of Personnel													
4	Incident Operations Staff	1 per 5 VIDS per system													
No	Role / Position	No of Personnel													
4	Incident Operations Staff	1 per 5 VIDS per shift													
8.	Schedule C, Chapter 3, Video Surveillance System/ Traffic Monitor Camera System (TMCS), Clause 3.4. Technical Requirements, Point 12,	r)- Tilt Range +10 to -92 degrees	r)- Tilt Range +10 to - 90 degrees or better												
9.	Schedule C, Chapter 10, Clause 10.1 Scope, Point (iii), And Clause 10.3.2.1. Video Wall (large display board	<div>1. The video wall shall typically be a matrix of 3x3 but the controller shall be capable and flexible enough to accommodate varied different monitor matrix geometries as dictated by space availability or constraints.</div> <div>2. The typical video wall display size shall be 3x2m.</div> <div>12. Separate Video Wall shall be provided for VIDS with minimum 75” smart TV</div>	<div>1. Individual monitor utilized should be full HD or better. The video wall controller shall be capable and flexible enough to accommodate varied different monitor matrix geometries as dictated by space availability or constraints.</div> <div>2. The typical video wall display size shall be a minimum of 4.5 x 2 m.</div> <div>12. Separate Video Wall shall be provided for VIDES with minimum 75” full HD smart TV</div>												

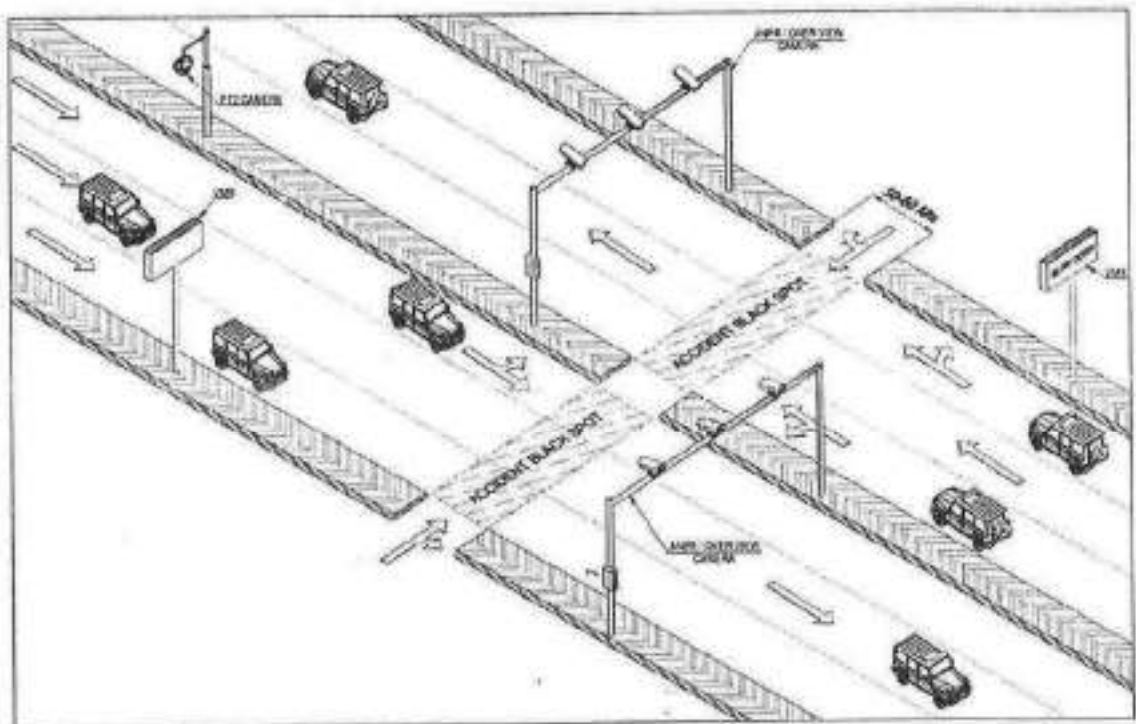


National Highways Authority of India

G-5&6, Sector-10, Dwarka, New Delhi - 110075

Advanced Traffic Management System (ATMS) on NHs

Functional & Technical Specifications of ATMS Components / Sub-Components



October 2023

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Document Control Status

Document Amendment Record			
Version	Date	Prepared By	Brief Record of Change
June 2016	05-05-2016	M/s CDM Smith INC, (Formerly Wilbur Smith Associates) having its registered office at No.8, Second Floor, 80 Feet Road, RT Nagar, Bangalore - 560032, Karnataka, India	Part of a set of documents prepared under consultancy project on Road Safety Zone (RSZ) Concept on East-West Corridor NH-25 (27) under Road Safety Component of ADB Loan 2029-IND.
August 2016	02-08-2016	NHA	Addition of: (i) Travel time estimate system (ii) Disaster Management framework (iii) Addition of requirement on external connectivity. Improvements in Technical Requirements of CCTV, Mobile Radio Communication System.
October 2023	06-08-2023	NHA	Addition of: a. Basic Incident management in Video Surveillance System b. The existing VIDS (Video Incident Detection System) has been upgraded to VIDES (Video Incident Detection and Enforcement System) c. VIDES includes additional incidents, functionalities and capturing photo evidence for eChallan d. Merging of ATCC and VSDS with VIDES e. Improvements in technical requirements of CCTV, PTZ, VMS and Control Center Hardware f. Need based inclusion of Emergency Call Box and Mobile Radio Communication System g. Expansion of objective Service Level Requirements. Deletion of: a. MET b. Portable WIM c. Travel Time Estimation System

ACRONYMS and ABBREVIATIONS

APTS:	Automatic Power Transfer Switch
AI/ML	Artificial Intelligence/Machine Learning
ATMS	Advanced Traffic Management System
BIS	Bureau of Indian Standards
BS	British Standard
CIF	Common Interface Format
CCTV	Closed Circuit Television
DLP	Defects Liability Period
DM	Disaster Management
DDMA	District Disaster Management Authority
ECB	Emergency Call Box
ERT	Emergency Road side Telephone
EN	European Standard
FAT	Factory Acceptance Tests
FPS	Frames Per Second
GUI	Graphical User Interface
HDPE	High-density polyethylene
HVAC	Heating Ventilation and Air conditioning
IRC	Indian Roads Congress
ITM	Integrated Traffic Management
ITS	Intelligent Transport Systems
ITU-T	Telecommunication Standardization Sector of the International Telecommunication Union
JPEG	Joint Photographic Experts Group
LAN	Local Area Network
MET	Meteorological Data Systems
MoRTH	Ministry of Road Transport and Highways
MTBF	Mean Time between Failures
MTTR	Mean Time to Repair
NAS	Network-Attached Storage
NDMA	National Disaster Management Authority
NDRF	National Disaster Response Force
NHA	National Highways Authority of India
NMS	Network Management System
NVR	Network Video Recorder
OF	Optic Fibre
OFC	Optic Fibre Cable
O&M	Operation and Maintenance
PIJF	Polythene Insulated Jelly-filled
PTZ	Pan, Tilt, Zoom
SAT	Site Acceptance Tests
SDMA	State Disaster Management Authority
SIT	System Integration Test
Solar PV	Solar Photo voltaic
SWB	Static Weighbridge
TEC	Telecommunication Engineering centre of the Government of India
UPS	Uninterruptible Power Supply
VMS	Variable Message Signs
WAN	Wide Area Network
WIM	Weigh-in-motion
WPC	Wireless Planning Council
Note: The document uses "ATMS Contractor", "Service Provider" and "Service Integrator" interchangeably. They refer to the Agency engaged by NHA for execution of ATMS works.	

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Chapter 1 INTRODUCTION

This document is a part of a set of documents to facilitate NHAI for implementation of the Advanced Traffic Management System on National Highways, Government of India. Ministry of Road Transport and particularly, NHAI have taken the initiative to provide guidelines for ATMS implementation in the past and the references can be found in IRC:SP:87 (Manual of Specification and Standards for Six-laning of Highways through PPP), IRC:SP:84 (Manual of Specification and Standards for Four-laning of Highways through PPP), IRC:SP:99 (Manual of Specification & Standards for Expressway) and MoRTH manual prescribing Specification for Road and Bridge Works (5th Revision) etc. As these references focused broadly on road infrastructure development, this document is focused mainly on implementation of comprehensive and integrated Advanced Traffic Management System (ATMS) on National Highways.

1.1 Purpose of this Document

This Document is the revisit of NHAI Policy Circular No Technical 214/2016 dated 15.09.2016 for Implementation of Advance Traffic management System (ATMS) on developed Sections of National Highways with NHAI. The adequacy and relevance of the provisions of the Circular dated 15.09.2016 was examined and it was observed that while majority of the provisions under the Circular are still relevant, some provisions required improvements as per latest technology, the Purpose of this document is to identify the essential components / sub-components that should necessarily be included in such a project and provide detailed functional requirements and standards to be adhered to by such components / sub-components to ensure achievement of desired safety, reliability, availability and environmental requirements.

The Functional and Technical specifications prescribed in this document are the minimum/benchmark requirements individually and collectively to be fulfilled by various ATMS equipment and systems. However, to encourage adoption of best practices with upcoming improved technologies in the field of Intelligent Transport System (ITS) with the passage of time, the implementing agency shall ensure to offer latest and most relevant technical solutions.

1.2 Scope of Document

Broadly, the ATMS implementation shall cover design, supply, installation, commissioning and operation and maintenance of Advanced Traffic Management Systems (which is one of the components of Intelligent Transport System – ITS). The system would include out-door equipment including emergency call boxes, variable message sign systems, vehicle actuated speed system, Traffic monitoring close circuit TV camera (CCTV) system, traffic counting and classification system, mobile radio communication system and transmission system. The indoor equipment would comprise a large display board, central computer (with Network Management System – NMS), CCTV monitor system, call centre system or management of emergency call boxes housed in a control centre with uninterrupted power supply. Any new technology, meeting the requirements specified in these specifications should not be excluded. The systems shall meet following objectives:

- Smooth and uninterrupted traffic flow
- Enhance road safety
- Real time information and guidance to users
- Emergency assistance round the clock
- Alerts for abnormal road and weather conditions

- Reduced journey time and inconvenience
- Enforcement through eChallans

Keeping in view the above objective, ATMS shall inter-alia provide the following facilities to various stake holders.

Highway Users	<ul style="list-style-type: none"> ➤ Make emergency calls to Control Centre in case of accidents, breakdown, fire and ambulance. ➤ Receive alerts / alarms messages about unusual condition on the road.
Traffic Managers	<ul style="list-style-type: none"> ➤ Data / information for efficient and effective handling of traffic ➤ Control systems to configure / change variable message sign from control centre ➤ Information regarding location of any accident, incoming calls, help required and messages to be passed to third parties (other stake holders) ➤ Mobilize, monitor and guide the movement of ambulances, cranes and patrolling vehicles with information regarding traffic congestion, speed and weather conditions.
Regional Level Control Centre and Master Control Centre for NHAI, HQ	<ul style="list-style-type: none"> ➤ Provision of reviewing live feed and / or recorded archives of CCTV video footage as well as voice messages ➤ Live audio Patch-up with the highway stretch manager and / or ambulance facility and Trauma Care Centre ➤ Help assessment of traffic position at specific location on NHs for authority to take adequate action thereupon. ➤ Live feed of the GIS map-based monitoring facility of the entire highway stretch including all details related to incident management. ➤ Active monitoring of performance (by sampling) of ATMS System Service Provider ➤ Comparison of similar data between two or more selected ATMS enabled stretches and Video conferencing with one or more ATMS control centres. ➤ Continuous learning to improve process, suitability of technology, optimal choice of devices / equipment for continuous enhancement of NHAI's road safety mission.
Local Traffic Police and Enforcement Agency	<ul style="list-style-type: none"> ➤ Provision of reviewing live feed and / or recorded archives of CCTV video footage as well as voice messages ➤ Help assessment of traffic position at specific location on NHs for authority to take adequate action thereupon. ➤ Provision of dedicated work station in ATMS for Traffic Police Representative to sit and improve coordination and surveillance vis-a-vis traffic police operations. ➤ Integration with Vahan and data sharing for eChallan generation.

A typical ATMS implementation shall comprise of at least the systems / sub-systems depicted in the table below and meet the applicable latest versions of the international/national standards, included therein:

S. No.	Subsystem	Items	Designed to conform	Certified to Standard
1	Video Surveillance System (CCTV)	CCTV Fixed Camera	FAL, BSEN 62676-1-2, ONVIF specifications profile S & profile G, BSEN 62676-2-2, BSEN 62676-2-3	EN 61000, IEC 60068-2-27, EN 60529(IP66)
		CCTV PTZ Camera		
		Video Encoder	H.264 (IEC 14496-10), EN 62676-1-2, BSEN 62676-2-2, BSEN 62676-2-3	

S. No.	Subsystem	Items	Designed to conform	Certified to Standard
		Road-side Housing and Support Structure	BS EN 12767	EN 60529 (IP56)
2	Video Incident Detection and Enforcement System (VIDES)	Video Camera	PAL, BS EN 62676-1-2, BS EN 62676-2-2, BS EN 62676-2-3	EN 61000, Relevant BIS certification EN 60529 (IP66) Local State Speed Calibration etc.
		Road-side Housing & Support Structure	BS EN 12767	EN 60529 (IP56)
3	Vehicle Actuated Speed Display	Display	EN 12966	EN 60529 (IP 56)
		Support Structure	BS EN 12767	
4	Emergency Road Side Telephone System	Phone System		
		Road side Housing and Support Structure	EN 60529 (IP65), BS EN 12767	
5	Variable Message Signs (VMS) [Fixed and Portable]	Display	IRC 67, IRC SP85	EN 12966 EN 60529 (IP56)
		Road side Housing and Support Structure	BS EN 12767	EN 60529 (IP56)
6	Automatic Traffic Counter cum Classifier (ATCC)		MORTH - Specifications for Road & Bridge works : 5 th Revision	
7	Network / Communication Infrastructure	Cable		TEC Approved
		Protocol	IEEE 802.x, RS 485, RS 422	
8	Mobile Radio Communication System		ETSI DMR tier 3 / ETSI DPMR Mode 3 / NXDN Trunking	
9	ATMS Control Centre		EN 50132-7, Relevant NTCIP standards, IEC 12207	

NOTE: Other relevant standards and codes required to be adhered to by the service provider are listed in Chapter 16 of this document. Guideline for placement of various ITS devices and subsystems is detailed in Appendix - A of this document.

1.3 Documents Layout and Contents

This document details the technical specifications for the design, supply, installation, commissioning and maintenance requirements for a comprehensive and integrated Advanced Traffic Management System (ATMS) for National Highways in India. This document describes each type of ATMS equipment under the following headings:

1. Scope
2. Equipment Function
3. Functional Requirements
4. Technical Requirements
5. Environmental Requirements
6. Testing
7. Installation Requirements
8. Maintenance Requirements
9. Operational Requirements

The first section of the document details the general provisions for ATMS equipment, with the following sections providing details for each type of equipment listed in section 1.3. Where details specified within the specific equipment sections overlap with those of the General Provision for ATMS, the specific equipment section shall take precedence.

1.4 Scope of Work

Briefly, the ATMS components to be deployed shall inter alia include:

- (a) Video Surveillance System/Traffic Monitoring Control System
- (b) Video Incident Detection and Enforcement System (VIDES)
- (c) Vehicle Actuated Radar Speed Displays
- (d) Emergency Roadside Telephones
- (e) Fixed / Portable Variable Message Sign
- (f) Automatic Traffic Counter cum Classifier (as part of VIDES)
- (g) The ATMS Control Centre including the equipment (hardware, software, and local networking)
- (h) Communications System utilizing Optic fiber, point-to-point wireless links, GSM/GPRS and Wi-Fi Communications linked to ATMS Control Centre.
- (i) Power supplies for field equipment: working on Mains power supported with back-up (largely on renewable energy) to facilitate 24 X 7 operation and for the ATMS Control Centre working on Mains power supported by UPS and Diesel generator set of adequate capacities, to facilitate 24 x 7 operation.
- (j) Disaster Management Support System.

1.4.1 The essential feature of the proposed ATMS is the presence of an integrated Traffic Management and Rescue Console. The Traffic management and rescue console, under the leadership of the ATMS Control Centre, is intended to introduce an automated check-list based approach to ensure an integrated and efficient service delivery to the various stakeholders to prevent accidents and in case the accident does happen, then timely coordinated action in rescuing accident victims and early restoration of traffic.

1.4.2 Services shall be governed through Service Level Requirements (SLR) mentioned in Appendix-B to this document. Service Level Requirements basically prescribe identified key performance standards and minimum benchmark to be achieved by the Service Provider in service delivery.

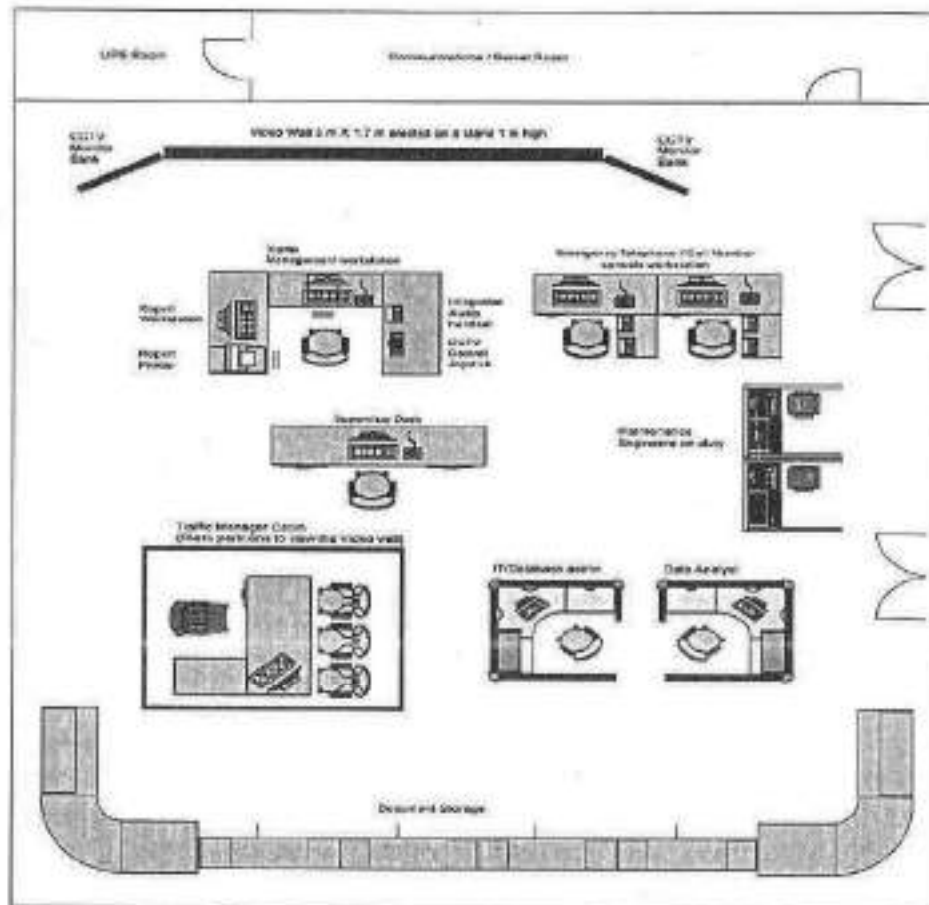
1.4.3 Service Provider shall be responsible to deliver complete turnkey solution of ATMS and entire responsibility for system design, testing, civil and electrical works including cabling / conduit, electrical power requirement including provision of uninterrupted power supply (UPS) of adequate capacity shall vest with the service provider.

1.4.4 ATMS Control Centre: The most crucial and important part off the project shall be establishing the ATMS Control Centre that will accommodate and operate the entire ITS systems. The Figure shown below provides an indicative layout of the ATMS Control Centre facility that will accommodate and operate the ATMS systems to facilitate operations such as:

- (a) Emergency Response System: call logging (Emergency wayside phones) and incident management on the Integrated, visual console and audio communication station;
- (b) Data analysis and reporting systems;
- (c) Traffic Management system logging vehicle speed & flow data;
- (d) Operational procedures;
- (e) Emergency events and incident reporting database.

1.4.5 It is proposed that the ATMS Control Centre facility be established in a building on the highway approximately midway of the corridor within the ROW where feasible. Rescue & Patrol vehicles shall be located at more than one strategic location along the highway to ensure an adequately rapid

response during rescue and traffic management. A possible choice could be to situate it with the Traffic Aid Post and Medical Aid Post that the Concessionaire is required to provide within Article 17 & 18 of the Concession Agreement. Where as in case of public funded projects the Service Provider shall prepare at least three alternative proposals of ATMS Control Centre and submit to NHAI for approval. Priority be given to choose a location which is within RoW and is in close vicinity to infrastructure (BTS/Exchange) of any telecom service provider so that network connectivity from ATMS Control Centre may easily be ensured.



Concept Layout of ATMS Control

1.4.6 Service Providers Responsibility/Obligations

The Service Provider agrees and undertakes to fulfil the minimum service requirements/ obligations prescribed under Appendix B to this document. Broadly, these shall *inter-alia* include

- 1.4.6.1 Setting up of an integrated ATMS solution including ATMS Control Centre as per requirements including all related civil and mechanical works on the highway.
- 1.4.6.2 Coordinate with respective agencies for obtaining the necessary approvals before commencing works. System installation shall be done with minimal disruption to on-going operations.
- 1.4.6.3 Strictly comply with the prescribed timelines and technical specifications.
- 1.4.6.4 Operating the ATMS to meet the Service Level Requirements (SLR) prescribed.
- 1.4.6.5 Performing system maintenance to ensure adhering to the

requirements for system maintenance.

- 1.4.6.6 Ensure ATMS architecture is capable of remote monitoring. NHAI would monitor the service performed and / or status of traffic /highway administration including handling of incidence by highway patrol through real time access of ATMS Control Centre of the Service Provider through NHAI's Regional Control Centre and / or Master Control Centre in New Delhi / NCR. Service Provider shall provide on-line access to the control centre for NHAI and/or NHAI's representative meeting the prescribed provisions. NHAI may prescribe Electronic Data Interchange (EDI) Protocol for real time access to ATMS data and Service Provider will be bound to follow such EDI protocol.
- 1.4.6.7 The service provider shall be responsible to comply with all statutory requirements concerning the subject matter viz. compliance to Labour Laws, Tax(es), employee insurance etc. and indemnify NHAI and its employees or representative against any such claims.
- 1.4.6.8 The service provider shall be responsible for arrangement and provision of all sources of electrical power and communication for setting up the ATMS and providing the required services in compliance of SLR.
- 1.4.6.9 The Service Provider shall suitably interface their ATMS system with the 24X7 National Highways Helpline (1033) to meet the service level requirements.
- 1.4.6.10 Reporting Requirements: Providing monthly performance reports related to operations and maintenance of the project. Report formats will be developed in consultation with NHAI and shall include all parameters considered under SLR.

1.4.7 Technical Resources / Personnel

- 1.4.7.1 The service provider shall form a multi-disciplinary team for undertaking this assignment. The agency shall be fully responsible to deploy its resources / personnel whose qualifications and experience fully commensurate with the task/responsibilities assigned and to achieve the objectives under the. The Personnel deployed should be experienced enough and should have proficiency in the requisite techniques / skills so as to provide practical, realistic and actionable service. Indicative minimum staffing and qualifications requirements for ATMS Control Centre and the process flow is attached to this document (Appendix C).

1.4.7.2 Removal and/or Replacement of Personnel

If NHAI (i) finds that any of the Personnel has committed serious misconduct or has been charged with having committed a criminal action, or (ii) has reasonable cause to be dissatisfied with the performance of any of the Personnel, then the service provider shall, at the NHAI's written request, forthwith provide as a replacement a person with qualifications and experience acceptable to NHAI.

1.4.7.3 Performance standards:

The service provider shall undertake to perform the services with the highest standards of professional and ethical competence and integrity. Keeping in view the sensitivity involved, the personnel deployed should maintain confidentiality / integrity at all times and work in a professional manner to protect the interest of NHAI. The

firm shall promptly replace any personnel assigned under this contract that NHA considers unsatisfactory.

Chapter 2

GENERAL PROVISIONS FOR ATMS EQUIPMENTS

2.1 Overview

2.1.1 Purpose

This section describes the general requirements for the design, supply, installation, commissioning and maintenance of ATMS systems.

2.2 Non-Functional Requirements

2.2.1 Performance

1. Each equipment specification contained in this document details the specific performance requirements pertaining to that specification.
2. All ATMS equipment shall work 24 hours a day on all days of the year.

2.2.2 Reliability

1. Each type of ATMS equipment shall be designed to operate continuously for a period of time as specified in the relevant section of this document, when used in the ATMS project environment.
2. Generally, each item of ATMS equipment shall have a Mean-Time-to-Repair (MTTR) (time to full normal operation following a failure) specified under required service levels in the associated Service Level Agreement contract. Equipment failure and MTTR metrics will be monitored and recorded through an exclusive, computerized ATMS Asset Management system to be set up by the service provider that shall be continuously maintained for audit by NHA or its authorized representative.

2.2.3 Maintenance

Routine and preventative maintenance procedures shall be provided for all ATMS equipment to ensure that the equipment continues to work within the prescribed service levels.

2.2.4 Environmental

1. All ATMS equipment must maintain full functionality and continue to operate within the limits of this specification when subjected to the working environment of the project.
2. All equipment shall function and perform as per the specification, or better, in ambient temperatures ranging from -10°C to 55°C and in 95% relative humidity non-condensing.

2.2.5 Documentation

The ATMS Service Provider shall be adequately prepared with necessary documentation for effective operations and maintenance. Towards this, all ATMS Equipment shall be supplied and used with technical documentation

comprising such manuals and handbooks accompanied by maps, plans, drawings, diagrams, specifications, computer programs, flow diagrams, coding lists, library programs, and all such information as may be necessary for the Service Provider to effectively operate and maintain the system.

1. The documentation shall be provided under the following general headings and indicative contents (which are not necessarily exhaustive) as may be appropriate to the equipment being supplied;

- a) GIS Based Design Plan of ATMS

- i) The Service Provider will submit a GIS based file with the proposed placement of all key hardware such as all different types of cameras, VMS, VSDS, VIDES, ECB location of command center and any other installations. The KMZ or QGIS project file has to be submitted for approval to NHAI or representative nominated by NHAI before the finalization of the locations of key hardware.
- ii) An Indicative Strip Chart as shown in Appendix-E should also be submitted for ready reference.

- b) Hardware details:

- i) Basic technical data, type nos., ratings, product codes, etc.
- ii) Details of energy usage at defined load calculation
- iii) Technical description
- iv) Warnings and restrictions
- v) Drawing lists, parts lists
- vi) Module identification codes
- vii) Mass and overall size of each type-numbered item
- viii) Packaging material details.

- c) software manuals:

- i) Data, descriptions and details.

- d) Drawings - mechanical and structural:

- i) General arrangements
- ii) Principal detail drawings.

- e) Drawings - electrical and electronic:

- i) System schematics, circuit and wiring diagrams.

- f) Installation instructions:

- i) Comprehensive instructions (including drawings for site assembly) for correct installation and connection of all parts of the Equipment, to be retained for reference purposes
- ii) Instructions relating to each item of equipment likely to be installed separately.

- g) Commissioning instructions:

- i) Set-up details of addresses, operating parameters, control ranges and limits, etc.
- ii) Commissioning procedures and System Integration tests.

- h) Operating instructions:

- i) Procedures for normal operation.

- j) Maintenance instructions:

- i) Details of routine maintenance*
 - ii) Cleaning instructions*
 - iii) Trouble-shooting and fault-finding charts.*
 - iv) Maintenance information cards or booklets.*
 - k) Product 'End of Life' Plan:*
 - i) Instructions for dismantling the equipment without causing damage*
 - ii) Details of re-usable/recyclable components and materials and the coding system used to identify them.*
 - iii) Details of any precious metals*
 - iv) Details of any hazardous substances, heavy metals or other pollutants with instructions on their safe handling and disposal.*
3. Documentation shall be produced in accordance with the standard as required by the NHAI or NHAI's representative and shall be approved by the NHAI or NHAI's representative before the system is accepted.
4. Documentation shall use SI units in accordance with ISO 80000-1.
5. Detailed design drawings and structural calculations for each type of pole, gantry or structure (including foundations) used to mount ATMS equipment shall be submitted to the NHAI and/or the NHAI's nominated representative for approval after due certification by a Licensed Structural Engineer using state of the art softwares. The design calculations shall be carried out in accordance with relevant MoRTH/IRC standards where applicable.
6. The drawings shall show materials specification and finishes for each item of equipment proposed for use. All weld types and sizes shall be identified on the design and construction drawings.
7. Power schematic diagrams for all ATMS installations shall be submitted to the NHAI and/or the NHAI's nominated representative for approval.
8. Telecommunications schematic diagram shall be submitted to the NHAI and/or the NHAI's nominated representative for approval. The telecommunications diagram shall include all systems, subsystems and components, including connections to modems, devices and the telecommunications access and backbone network.
9. As-built record drawings shall include longitude and latitude data accurate to within two (2) metres for each of the ATMS equipment and infrastructure installed.
10. Documentation should be organized so that unnecessary repetition is avoided. Topics likely to be frequently referenced by the service provider (e.g. operating and maintenance instructions) should be given prominence. As it is recognized that the volume of the documentation and drawings to be provided will vary considerably with the complexity of the equipment being supplied (ranging from one ring binder to several volumes), the NHAI or NHAI's representative should be consulted for its agreement on the presentation and layout of the documents to be provided.
11. Documents and drawings should be maintained at site as well as provided to NHAI on CD-ROM in Adobe Acrobat (.pdf) file text recognition format (i.e. converted to pdf from the source program rather than scanned) using the version current at the time of supply. A minimum of two sets shall be provided. The disks shall be virus checked and fully marked up /labelled prior to dispatch

to the NHAI.

12. The NHAI or NHAI's representative may additionally require two sets of final documents and drawings in full size paper form for record purposes, which shall be provided on a due confirmation from the NHAI or NHAI's representative.
13. When paper copies of text documentation are to be maintained at site and / or provided to NHAI, they shall be in A4 format bound into durable binders. The manner in which drawings in paper form are bound may vary with their size and should be agreed with the NHAI or NHAI's representative prior to delivery.
14. Installation instructions to be included in the package of any item of equipment likely to be installed separately or in conjunction with the ATMS equipment, shall be in the form of a leaflet or similar. It shall have sufficient information (with diagrams) for the item concerned to be correctly installed in position and connected, and describe any necessary set-up procedure.
15. Maintenance information cards or booklets, one set of which is to be secured within each equipment enclosure or cabinet shall be encapsulated in a durable weatherproof format. They shall show the general layout of equipment and component modules and references in schematic form, and set-up addresses for on-site replacement of component modules.
16. The format and extent of electronic media and/or hardcopy presentation of technical shall be agreed with NHAI / NHAI's representative before final versions are produced.

2.2.6 Submittals

1. All ATMS equipment shall, as a minimum, meet all the requirements listed in these specifications. Future technological advances may allow for ATMS equipment to be provided that exceed the minimum requirements in these Specifications.
2. Systems and subsystems that minimize the possibility that failure of any single component or module will cause total system failure shall be provided. Failure of one component or module shall not cause the failure of any other component or module.
3. Product data, design and construction drawings for all of the components shall be submitted to the NHAI and/or the NHAI's nominated representative for approval.
4. Heat-load calculation sheets, accompanied by related manufacturer's data sheets to support justification of proposed cooling systems shall be submitted to the NHAI and/or the NHAI's nominated representative for approval. Power consumption calculations to support proposed power distribution type and size shall also be submitted.

2.2.7 Quality Assurance

1. The ATMS equipment provider shall have in place a quality system documentation complying with ISO 9001, for the activities of design, development and production of the ATMS equipment to be supplied unless otherwise agreed by the NHAI or NHAI's nominated representative. The quality system shall cover each and every location where such activities are undertaken.



2. The NHAI or NHAI's nominated representative may audit the potential supplier's quality system and test facilities before approving use of the proposed supplier who shall essentially have an inhouse facility to integrate all major field equipment's and demonstrate to the NHAI. NHAI reserves the right for the same.
3. The following requirements must also be considered:
 - a) The design and installation of Electrical Installations shall comply with the requirements of the Bureau of Indian Standards.
 - b) The service provider shall be required to provide, at their own expense, samples of the proposed equipment and all associated approvals, test reports and schedules to verify that the equipment meets all of the NHAI's requirements.

2.2.8 Field-Access & On-line remote Access during the Contract period

1. Field-Access: All the equipment of the ATMS system shall provide access for data extraction and control (where applicable) in a secure manner from a local laptop computer. The access shall be either in the form of a wired connection via a standard interface like TCP/IP (in the form of an Ethernet connection), RS 232, RS 485 or Wireless Lan. It shall be further possible in a secure manner to view and transfer such accessed data on to the appropriate ATMS server database to 'make-good' any data loss that may have occurred during normal operations. Such an operation of data extraction and transfer to the ATMS server database shall be automatically detected and logged into the system as an event for causing a system alert and appropriately included in the event report.
2. The service provider shall use an appropriate GUI supported software (s) for the performing the above data access, control and transfer to the ATMS database.
3. The systems commissioned by the Service Provider shall provide, during the entire period of the Contract, adequate remote on-line access (via-internet) having a dedicated IP for the NHAI and / or NHAI's representative/Local Traffic Agency for on-line evaluation of the functioning of each equipment / sub-system, including all field equipment. The Service Provider shall also provide the NHAI a suitable Modular software for the same. In the case of PTZ CCTV Cameras, this tool shall also support the facility of observing real-time images from each camera by remote operation of the Pan-Tilt-Zoom facility. NHAI reserves the right to include the results of any such examination by NHAI and / or its representative in the achieved service levels for the period under evaluation.
4. For the purpose of enabling the above on-line access facility, each of the equipment / sub-systems shall be Internet Protocol (IP) based supporting the Simple Network Management Protocol (SNMP), TCP/IP, RTSP or suitable method.
5. The Service Provider will be required to configure direct online access of video streams for each camera through either RTSP, Port Forwarding, HTTP, WebRTC, Cloud NVR or any protocol supported by NHAI ATMS Cloud at HQ and Local Traffic Agency Command Control Centre.
6. Each camera (VIDES, CCTV or one placed in Command Centre) shall be registered on NHAI ATMS Module at HQ. This registration will include but not



limited to lat-long, public IP, RTSP url, authentication details if any and web-link to access the stream of individual cameras respectively.

7. The above tool shall also include a feature by which the NHAI and / or NHAI's representative can generate detailed performance, operation and maintenance reports without the need for any support / intervention from the Service provider's personnel.
8. Where applicable, the ATMS shall be integrated with the Local Traffic Police's Command and Control Centre. This shall include sharing of live feeds of all TMCS and VIDES cameras for viewing and/or controls and any additional modular software that allows for the same. If view-only access can be provided through login into ATMS software such that above requirements are met, that may also be considered.

2.3 Functional Requirements

2.3.1 Power Supply

1. The field equipment shall have the locally available mains power supply (from the electricity utility through Regulated source) as the primary source and supported with a relevant Renewable energy - based power supply for back up and / or generator back up to ensure 24 x7 operation.
2. The ATMS Control Centre shall have the locally available mains power supply (from the electricity utility) as the primary source and supported with a UPS and generator back up to ensure 24 x 7 operation.
3. Except where detailed in specific sections below, all ATMS equipment shall be powered from either
 - a) A single phase 230Vac 50Hz supply.
 - b) A three phase 440Vac 50Hz supply.
4. ATMS enclosures shall include a power distribution subsystem for supplying power supply to each component within the enclosure and related / Inter-connected ATMS equipment. The circuit breakers shall be properly sized according to the expected loads of the ATMS equipment and to meet relevant electrical code requirements.
5. All electrical equipment and cabling shall be provided in accordance with relevant BIS standards. In case there no relevant BIS standard exists the BS 7671 standard shall be applicable.
6. The power distribution panel shall be directly fed by the main circuit breaker at the electrical point of service. The power distribution assembly shall include an interface and connection to the UPS (where provided). The power assembly shall be connected to the earthing system.
7. The enclosure shall be earthed in accordance with the relevant BIS regulations.
8. The enclosure shall include a 230Vac 15 Amps 3-pin dual socket power outlet conforming to BIS standard.
9. The power sockets shall be installed in accordance with relevant BIS standard.
10. A Multi-stage Transient Voltage Surge Suppressor (TVSS) shall be provided for each external cable (related to power supply, signal, data or any other), connection which is terminated at any item of exposed external equipment, or routed through an outdoor area. The TVSS shall be rated in accordance with BIS requirements.

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11. The TVSS shall be capable of handling minimum 30KA fault current. Provision shall be made for protection of earthing and the shield/armour of coaxial cables and TVSS for each signal conductor
12. The TVSS shall not only clamp the voltage, it shall also divert the fault currents to ground. If a TVSS is destructively tripped, there shall be a clear visual indication that the ATMS equipment is no longer protected and the TVSS needs a reset or replacement.
13. ATMS equipment shall automatically regain full operational functionality when related electrical power supply is restored, without the need for manual intervention.

2.3.2 Uninterruptible Power Supply (UPS) Subsystems

1. The worst-case power-load data shall be used to design the electrical conductor sizes. These shall be submitted to the NHAI and/or the NHAI's representative for approval.
2. A UPS shall be provided wherever required. The UPS shall meet the requirements of relevant standards of BIS.
3. Unless otherwise stated in the design drawings and/or specifications, UPS with a minimum of Six (6) hour backup shall be provided for all ATMS field equipment and telecommunications device locations. The Batteries of UPS system should be regularly replaced so as to ensure the specified back-up.
4. An Automatic Power Transfer Switch (APTS) shall be provided inside the ATMS ground mounted enclosure which transfers power from one of the external sources to the electrical distribution system. The APTS shall monitor the status of the primary power source and transfer the power connection to the secondary power source when primary power source fails or suffers degradation. The APTS shall be provided with means to operate in manual mode.
5. The APTS must be able to transfer the connection with the internal power system, from the primary power source, to the secondary power source, within 1 mains power cycle (less than 20ms).
6. Additional equipment necessary to eliminate the delay in the transfer of power sources which may cause the ATMS equipment to reboot shall be provided.
7. Each external power supply line shall be terminated at the APTS.

2.3.3 Earthing

All earthing of ATMS equipment shall comply with BIS regulations.

2.3.4 Telecommunications

The field equipment shall be connected to the ATMS Control Centre via an optic fibre network using suitable interfaces. Refer to section 12 within this document for details of telecommunications and networks.

2.4 Hardware Design Requirements

2.4.1 Mechanical and Housing

Requirements Non-Ground Mounted Equipment

1. ATMS equipment not contained in a ground mounted equipment enclosure will have specific housing requirements depending on location, weather

conditions and vibration from road vehicles.

2. The housing shall be structurally rigid. Mounting accessories such as nuts, bolts, studs, locks, washers etc. shall be of corrosion resistant stainless /mildsteel, IP 65 or better. The whole assembly shall withstand vehicular fumes without degradation for its entire service life.
3. Housing design shall be conducive to easy maintenance.
4. Housing shall secure the housed equipment, from tampering and theft. Means shall be provided to raise an alarm in the control room in case of tampering.
5. Cable entries to connect the signal, power and control wires to the encased equipment shall be provided and the housing shall meet IP65 to the minimum (unless otherwise specified for a particular ATMS equipment under the relevant section of this document).
6. Housing shall have adequate space to accommodate cable overages normally provisioned for future re-connection.
7. Forced air cooling within the housing shall be provided if installation situation demands.
8. Viewing window in case of camera housings shall not introduce distortions or artefacts on the image.
9. Suitable arrangements to prevent misting within the housing shall be provided where ever necessary.
10. Further details are included in sections relevant to each type of ATMS equipment.

2.4.2 Ground Mounted Equipment Enclosures and Poles

2.4.2.1 Ground mounted enclosures and mounting arrangements

1. The ground mounted enclosure shall house telecommunications equipment, power and other related equipment necessary for the operation of ATMS equipment.
2. The equipment must continue to work within its normal operating parameters in this environment, regardless of location.
3. The ground mounted enclosure shall be weather resistant and conform to BIS requirements with an ingress rating of IP65, as a minimum. Where the ground mounted enclosure needs to be penetrated, such as to facilitate installation of cables, provisions must be made to the penetration(s) in order to maintain the enclosure rating.
4. The enclosure shall include a secure locking mechanism to make it tamper-proof. Further there shall be a provision to generate automatically an electronic signal on any attempted tampering that can be used to generate an audio-visual alarm at the control centre.
5. Each enclosure door shall be equipped with an adjustable doorstop to hold the door open.
6. Warning labels shall be provided for all electrical panels in accordance with BIS or BS 7671. Asset identification information shall be provided on the outside of the enclosure and shall be weather resistant.
7. All internal connectors, components and wire terminations installed in the enclosure shall be labelled in accordance with the design drawings.
8. Racks and shelves shall be provided in the enclosure to mount equipment as needed, including telecommunications devices and power assemblies. The rack

shall comply with: BIS requirements (or approved equivalent international standard).

9. The rack shelves shall be capable of sustaining a constant 10 kg load. For all enclosures utilizing telecommunications services from a telecommunications network provider, a nominal mounting space of 200mm x 300mm x 75mm shall be provided for interface modules used by the service provider. The enclosure shall provide an additional fused or breaker protected, UPS- powered receptacle for related power requirement.
10. The ground mounted enclosure shall include an LED lighting fixture, minimum rating 5 watts, complete with lens or shield and high-efficiency LED lamp driver.
11. Ground mounted enclosures shall be mounted on a concrete foundation of the concrete class and dimensions shown in the detailed project design drawings. A cabinet riser shall be included when the cabinet is located below grade to protect against water incursion.
12. All mounting arrangements for ATMS equipment shall also comply with the requirements of that equipment as detailed in this specification.
13. The foundation and the foundation bolts for Ground mounted enclosures, tilt and fixed poles etc. shall be fabricated using a suitable (site specific grade of steel) material. The assembly shall be galvanized to a minimum coating thickness of 100 microns.
14. Galvanized Nuts, locknuts, locking pins washers etc. shall be supplied as a part of the foundation.
15. Fixing templates with a placement accuracy of at least +/- 1mm shall be provided to allow for the correct orientation and installation of the steel foundation on to the concrete base.
16. The strength of the foundation assembly shall be suitable to hold the Enclosure/Pole while withstanding weather conditions of the site for a period of at least 25 years.

2.4.2.2 Poles

1. The poles shall be designed to offer a stable platform for the imaging equipment to operate. Each pole and its associated hardware shall be fabricated using material appropriate for its installation site.
2. Nominal mounting height may be assumed as 12 meters. However, some situations may warrant different heights.

2.4.2.2.1 Tilt Pole

1. The poles shall be designed to offer a stable platform for the imaging equipment to operate. Each pole and its associated hardware shall be fabricated using material appropriate for its installation site (GI, marine grade SS, powder coated steel or enamel painted etc.)
2. Poles shall incorporate a mid-hinge tilt arrangement with a suitable counter weight to ensure a balanced tilt. The structural design shall conform to relevant standards and shall be certified by a statutory authority for structural integrity and maximum allowable vibration (typically caused by wind forces and other external stimuli) to ensure a stable image at full optical zoom of the camera mounted on it.
3. The design shall be tapering gradually over the whole length with the

minimum cross section at the top.

4. The design shall be base plate mounted with a matching foundation.
5. The poles shall be supplied with a mounting template, lag foundation bolts and other associated installation hardware.
6. An access door at the bottom of the pole shall be provided at a typical height of 0.5 meters from the base for the termination panel. The typical door dimensions shall be 125mm wide by 500 mm high or suitable size as required.
7. The design of the pole and hinge arrangement shall be such that the mounted equipment does not touch the base of the pole or ground when lowered.
8. Suitable eyelets, anchors, pulleys, etc. shall be incorporated in the pole design to allow for ease of raising the pole and to regulate the speed of lowering.
9. The design shall incorporate secure latching systems at the hinges to hold the two sections rigidly. There shall also be a provision to pad-lock the two sections to prevent unauthorized people from lowering the pole.
10. The base plate shall be designed to allow underground appropriate plastic /Galvanized Iron conduits to enter the base of the pole.
11. There shall be a tapered hole located not more than 150 mm from the top on the side of the pole to accept conduit fittings to route cables to the mounted imaging system components.
12. The assembly shall be of stainless steel/galvanized /Enamel Painted/powder-coated to an appropriate minimum coating thickness.
13. Deflection due to wind shall not exceed 0.1 degrees at a wind speed of at least 28m/s with the equipment mounted on the pole.
14. Suitably sized powder coated terminal box and terminal block assembly shall be provided and be treated as a part of the fixed pole. It shall be installed on the pole near the bottom end and the joint, cable entry/exit points (or glands) shall be sealed using a water proof sealant to avoid water ingress into the box or the pole base.

2.4.2.2.2 Fixed Pole

1. Fixed poles shall be used to mount flashing traffic lights and cameras in some of the locations.
2. Fixed pole cross section shall either be circular with a typical outer diameter of 150 mm or square cross section.
3. The joint(s) shall be seam welded.
4. The fully fabricated pole column shall be of stainless steel/galvanized /Enamel Painted/powder-coated to an appropriate minimum coating thickness.
5. The poles shall incorporate suitably designed holes on the sides to allow for electrical cables to enter or exit the pole undamaged.
6. The bottom portion of the pole shall be treated for corrosion resistance in accordance to the installation site.
7. The structural steel and design shall conform to relevant standards and shall be certified by a statutory authority for structural integrity and maximum allowable vibration (typically caused by Wind forces and other external stimuli) to ensure a stable image at full optical zoom of the camera mounted on it.
8. Deflection due to wind shall not exceed 0.1 degrees at a wind speed of at

least 28m/s with the equipment mounted on the pole.

9. Suitably sized powder coated terminal box and terminal block assembly shall be provided and be treated as a part of the fixed pole. It shall be installed on the pole near the bottom end and the joint, cable entry/exit points (or glands) shall be sealed using a water proof sealant to avoid water ingress into the box or the pole base.

2.4.3 Heating, Ventilation and Air Conditioning (HVAC) Subsystem

1. Where required, the ground mounted enclosure shall include an air conditioning system. The air conditioning system can be either passive or active. The design shall be submitted to the NHAI or NHAI's representative for approval.
2. Where a cooling system involving air conditioner or other heat-exchanger is used, the cooling system shall be mounted next to or on the exterior of the ATMS enclosure. Where the enclosure needs to be penetrated, such as to facilitate installation of pipes for coolant supply and return lines, provisions shall be made to the penetration(s) in order to maintain the enclosure rating.

2.4.4 Installation

1. The ground mounted enclosure shall be installed according to appropriate good engineering practices. All internal components and UPS (if required) shall be securely mounted.
2. For ground mounted enclosure installation, UV-resistant caulking material shall be applied along the joints of the enclosure. For mounting under a camera lowering system, the enclosure shall be positioned away from the space directly below related camera.
3. Provisions shall be made for all ducts (i.e. power, telecommunications, etc.), in accordance with the design drawings and/or specifications, that will facilitate the connection between the enclosure and the ATMS equipment.
4. Where cables enter the ground mounted enclosure, they shall be fixed and secured against movement and to relieve stress on the cable termination. All penetrations to the enclosure shall be sealed with silicone sealant to impede entry of gas, dust and water.
5. All wires/cables within the enclosure shall be secured and labeled. Earth wires from all electrical devices, including surge suppressors, shall be terminated directly to the dedicated earth terminal in the enclosure. Earth conductors shall not be daisy-chained from device to device.
6. All conductors carrying electricity at 60Vac or higher shall be segregated from all telecommunications, signal conductors and conductor carrying electricity lower than 60Vac. A minimum of 75mm shall be provided between these two conductor groups. Where conductors belonging to these two groups need to cross each other at distances closer than 75mm, the installer must ensure the conductors are at a 90 degree angle (perpendicular) to each other.
7. Each wire shall be identified on both ends of the wire with heat shrink, thermal transfer tube type wire markers in English. Adhesive labels are not acceptable. The wire markers shall be white with black lettering. Hand marking of the label is not acceptable.



2.5 Testing and Training

2.5.1 General Testing

Any test facility commissioned to carry out environmental, electromagnetic compatibility or optical performance tests or safety testing of telecommunications equipment shall have adequate accreditation meeting a relevant BIS standard or ISO standard or set up by a relevant government agency as a central facility.

1. Quality systems relating to the design, development, testing, supply and maintenance of software shall implement the guidance of ISO 9000-3.
2. The Service provider shall operate an Environmental Management System complying with the requirements of ISO 14001.
3. Any certification or accreditation necessary to comply with this specification shall have validity current at the time the Contract is placed and be maintained valid throughout the period of the Contract. Evidence of this certification or accreditation shall be provided.
4. The ATMS service provider shall be responsible for any testing and/or certification of equipment needed to meet or demonstrate compliance with statutory or regulatory instruments and requirements.
5. The ATMS equipment shall provide reasonable access and facilities for the NHAI or the NHAI's nominated representative to audit the operation of its quality systems and test facilities as deemed necessary by the NHAI or the NHAI's nominated representative.
6. The ATMS service provider shall accept all responsibility for the satisfactory quality, design and workmanship of the ATMS equipment being supplied and every part of the system and equipment whether manufactured by or supplied to the ATMS service provider by supply chain partners and whether specified or approved by name or not.
7. Documentation detailing the proposed schedule of tests to be undertaken at each stage of the test process for all ATMS equipment shall be provided. As a minimum, the tests shall include Factory Acceptance Tests (FAT), Site Acceptance Tests (SAT) and System Integration Tests (SIT). All costs for such tests shall be borne by the service provider.
8. All test equipment shall have a valid calibration certification.
9. The acceptance of each stage of testing does not imply that testing is complete at that stage. If problems are found at a later date or stage of testing, it may be necessary to return to an earlier stage of testing after repairs have been made to the system. If at a later stage of testing, an item of equipment is replaced, repaired, or significantly modified, the equipment shall be retested to the level necessary to isolate any problem and establish a course of action to remedy the situation.
10. Test procedures, checklists, test forms and data summary sheets shall be provided for each item. The proposed test procedures shall include a description of the test topics, applicable pass/fail metrics, planned test method and planned test instruments and tools. The NHAI and/or the NHAI's nominated representative shall be notified of the date, time and place of each test, as a minimum at least 28 calendar days prior to the date the test is planned to be conducted. The tests shall be conducted in the presence of the NHAI and/or the

NHAI's nominated representative unless specifically authorized in writing by NHAI otherwise.

11. The NHAI and/or the NHAI's nominated representative shall sign the trial test documents as proof of a successful trial test for each item of ATMS equipment and ancillary components. If the test trial is unsuccessful, the NHAI and/or the NHAI's nominated representative shall be given minimum seven (7) full business days' prior notification before rescheduling another test trial.
12. ATMS Equipment that fails to conform to the requirements of any test will be considered defective and the equipment will be rejected by the NHAI and/or the NHAI's nominated representative. In the event a defect is determined, it shall be determined whether it is limited to a specific unit or could be potential problems in all such units. Equipment rejected because of problems limited to the specific unit may be offered again for retest provided all issues of non-compliance have been corrected and re-tested and evidence thereof submitted to the NHAI and/or the NHAI's nominated representative. The evidence thereof shall include as a minimum a technical report detailing the investigation that has been undertaken to determine the cause of the failure. The report shall detail, as a minimum, the symptoms, cause and what action was required to remedy the failure. This report, shall be submitted and approved by the NHAI and/or the NHAI's nominated representative prior to a new test date being scheduled.
13. In the event that the ATMS equipment malfunctions during the test period, the NHAI and/or the NHAI's nominated representative may declare a defect and require replacement of all equipment at no additional cost. When a defect is declared, the test and test period shall be restarted from the beginning for that specific ATMS equipment.
14. If ATMS equipment has been modified or replaced as a result of a defect, a report shall be prepared and delivered to the NHAI and/or the NHAI's nominated representative for acceptance. The report shall describe the nature of the failure and the corrective action(s) taken. If a failure pattern, as defined by the NHAI and/or the NHAI's nominated representative, develops, the NHAI and/or the NHAI's nominated representative may direct that design and construction modifications be made to all similar units without additional cost to the NHAI. In the case of problems common to many units, all units shall be modified at no additional cost to the NHAI.
15. See relevant subsections below for a detailed description of each type of testing and what it involves.

2.5.2 Factory Acceptance Test (FAT)

1. The Factory Acceptance Test (FAT) shall be undertaken to ensure the ATMS equipment has been completed to the required functionality, safety and quality and meets all the contractual specifications.
2. The FAT shall be undertaken before shipping to site to ensure the equipment has been completed (constructed, programmed and pre-commissioned) to the required quality and is fully operational. This will include equipment assembled to its final deliverable state either inside or outside the ATMS project.
3. The FAT shall be undertaken on the equipment due to be shipped to the site to fulfil their operational requirement and not on an alternative product.
4. The factory acceptance test is used to:

- a) Provide proof of functionality, quality and integrity with a comprehensive checking process against the product specifications
 - b) Verify all-important documents (manuals, instructions, plans, drawings) to ensure they accurately reflect the requirements and the equipment operation
 - c) Ensure that the equipment performs as expected under the testable range of foreseeable conditions, including misuse and errors.
5. The FAT may be witnessed by the NHAI or the NHAI's nominated representative.
6. Each FAT shall be specific to the product being tested but shall include the following as a minimum;
- a) Pre-inspection testing and inspection
 - b) Pre-configuration of settings and software
 - c) Preparation of a test register
 - d) Review of drawings and documentation
 - e) Adequate testing of functionality
 - f) Interface testing
 - g) Full communications testing
 - h) Full cycle of powering up, logging on, logging off and powering down.
7. In the event of a test failing for any reason, the equipment provider must undertake an analysis of the fault. If the fault is considered to be irresolvable, then an exception shall be logged in the test register. At the end of the FAT, the completed tests should be evaluated with the test team including any test failures that occurred. An evaluation meeting shall agree on the nature of any faults encountered and discussing if the FAT should be continued.
8. One of the following actions shall be taken dependent on the extent of the fault:
- a) The FAT can be completed if the faults are minor, and the system shall be considered acceptable, subject to the fault being fixed before system commissioning at site. A FAT shall also be repeated on a new version of the system incorporating a fix for the fault.
 - b) Testing faults resulting from test procedure error or operator error shall be repeated. The test may be repeated immediately if the error is detected at the time of the FAT.
 - c) Major faults during the FAT shall lead to abandoning the FAT and rescheduling it for a later date pending the fault being resolved appropriately by the equipment provider.
 - d) The FAT tests specified shall be repeated for the SAT.

2.5.3 Site Acceptance Tests (SAT)

1. A Site Acceptance Test (SAT) shall be undertaken at each ATMS equipment location to verify that it meets the requirements described in the detailed project design specifications.
2. Following the installation of equipment, but prior to the connection with other ATMS systems and subsystems, a SAT shall be conducted on each piece of equipment and witnessed by the NHAI and/or the NHAI's nominated representative.
3. The test shall exercise all standalone (non-network) functional operations of the ATMS equipment and ancillary components installed and shall demonstrate

conformance with the requirements described in the detailed project design specifications, relevant standards and manufacturer specifications.

4. The quality of equipment and its installation shall be judged and verified to ensure compliance to relevant standards outlining operational safety, Ingress protection, Surge/ lightning protection and Radio interference.
5. Equipment installation shall be inspected to confirm compliance to equipment manufacturer's installation good practice recommendations.
6. The ATMS equipment provider shall ensure that the required testing equipment, including a portable computer and test software is provided for the SAT.
7. If any ATMS equipment or ancillary component fails to pass its SAT more than twice, it shall be replaced with new ATMS equipment or ancillary component of same make and model and the entire SAT shall be repeated until proven successful.
8. The SAT shall be conducted for each and every piece of ATMS equipment and ancillary components.
9. Time extensions shall not be granted to perform the SAT due to any failures. Failures during the SAT shall be resolved at no additional cost to the NHAI.

2.5.4 System Integration Tests (SIT)

1. The SIT shall also incorporate the network-manageable portions of the ATMS system including the ATMS system interface to the Regional and Main Control centres. The SIT shall begin after earlier stages of testing have been successfully completed (i.e. FAT and SAT) and accepted by the NHAI and/or the NHAI's nominated representative. When possible, the SIT shall be conducted during the harshest environment period deemed for that particular equipment. The duration of the SIT will be agreed with the NHAI or the NHAI's nominated representative prior to starting.
2. In the event of a system, subsystem, ATMS equipment, or ancillary component failure, with the exception of consumable items such as fuses, the Project shall be shut down for purposes of testing and correcting identified deficiencies (System Shutdown). System Shutdown is defined as any condition which, due to work performed by the Service provider, results in the Project, or any system, subsystem, ATMS equipment, or ancillary component thereof to cease operation.
3. The SIT shall be re-started after the identified deficiency has been corrected.
4. If the total number of System Shutdowns exceeds three (3) due to the same system or subsystem, ATMS equipment, or ancillary component;
 - a) The system, subsystem, ATMS equipment, or ancillary component shall be removed and replaced with a new and unused unit.
 - b) All applicable FAT and SAT, as deemed necessary by the NHAI and/or the NHAI's nominated representative shall be performed and the SIT shall be restarted upon written approval from the NHAI and/or the NHAI's nominated representative.
5. Time extensions shall not be granted to perform the SIT due to any failures. Failures during the SIT shall be rectified at no additional cost to the NHAI.
6. Upon the successful completion of the SIT and all the required submittals, testing, training, and documentation have been successfully submitted to and approved by the NHAI and/or the NHAI's nominated representative, the NHAI and/or the NHAI's nominated representative shall provide written

notice of Final Acceptance.

7. The notice of Final Acceptance implies that the system is ready for commercial operation subject to adequate training provided to the Operations and Maintenance personnel (Ref section 2.5.7).

2.5.5 Defects Liability Period (DLP)

1. Any defects in the system identified by the NHAI and / or the NHAI's nominated representative and provided to the Service provider in the form of a written notice during the Final Acceptance (Ref 2.5.4 above) shall be rectified during the Defects Liability Period. The above defects list shall also include any defects that surface during the DLP which shall also be rectified by the Service provider during the defined DLP itself.
2. Suitable tests for confirming the rectification of defects shall be performed by the Service provider to the satisfaction of the NHAI and/or NHAI's representative.
3. The DLP shall be in force for a period equal to the contract/concession period under the main Contract / Concession Agreement succeeding the notice of Final Acceptance.

2.5.6 Integration

1. Integration activities of the ATMS project shall be coordinated and undertaken such that all systems, subsystems, ATMS equipment and ancillary components are integrated with the ATMS Control Centre hardware and in accordance with the detailed project design specifications.
2. All integration activities shall be coordinated with the NHAI and/or the NHAI's nominated representative prior to commencement of any integration activities and shall be agreed in accordance with the project program.
3. Integration activities shall include the telecommunication nodes (i.e. Managed Ethernet Switches) with the existing and/or proposed fibre optic Ethernet telecommunications network for the design and connectivity of the ATMS Project.
4. All ATMS equipment shall be managed and operated by the ATMS Control Centre. The ATMS equipment shall be integrated as identified in the design drawings and/or specifications, into the ATMS Control Centre.

2.5.7 Training

1. Training shall be provided for the operation and maintenance of all the ATMS equipment and ancillary components.
2. Certification by the NHAI and / or the NHAI's representatives is mandatory for the Service provider to begin commercial operations of the system.
3. Training shall be designed to familiarize the Service provider's own Operations & Maintenance personnel and NHAI's representatives with the design, installation, operation and maintenance of the ATMS equipment and the overall system. The training shall also cover functionality, theory of operation, calibration, testing, performance and operating parameters.
4. A single organized training shall be conducted by the Service provider. A complete course outline and summary of the experience and qualifications of

the instructors shall be submitted to the NHAI and/or the NHAI's nominated representative for approval prior to commencement of training. Training sessions may be combined and/or shortened with the agreement of the NHAI. The training will be conducted at a location agreed with the NHAI.

5. The training materials shall be provided in English. The training materials shall include as a minimum:
 - a. Course outline
 - b. A Microsoft Office PowerPoint presentation showing detailed subject material
 - c. Operation and maintenance manuals in both electronic and paper format
 - d. Test equipment and tools
 - e. Any other required information.
6. Training shall also include the imparting of practical 'hands-on' experience to the trainees during each training session.
7. At the end of each training session, a test shall be conducted on the trainees to gauge their learning and the effectiveness of the training.
8. If, at any time during a training course, the NHAI and/or the NHAI's nominated representative determine that the course is not being presented in an effective manner, the training session shall be suspended. The Service provider shall make the necessary changes to the course, resubmit the required training materials for approval and reschedule the training course.

2.6 System Operation and Maintenance

1. The Service provider shall perform System Operation and Maintenance (O&M) (after Final Acceptance of the system) meeting the requirements contained in the Terms of Reference.
2. The Service provider shall deploy adequate number of trained personnel at site and at their back office to ensure that the above requirements are met. The Service provider shall submit, to the NHAI, reports as required on their Operation and Maintenance.

2.7 Computer Software Requirements

These requirements include those that are required to ensure adequate availability & sustainability of the ATMS software during the contract period.

1. The software for the system shall be designed and developed for adequate scalability of existing system functionality, addition of new functionality and easy maintainability. The medium used for storage and loading of programs shall be suitable for the way they are likely to be handled and stored and shall not require closely controlled environmental conditions.
2. The software development methodology used should ensure the development of modular software.
3. The ATMS service provider shall ensure that the development environment is adequately maintained during the contract period to ensure adequate support for the maintenance of the software under use and further additions/modifications to its functionality as may be required.
4. All documentation, diagrams (including software schematics or automated tool output) and specifications, shall be produced to recognize Standards and, apart from where other standards are agreed, shall use conventions, symbols and terminology defined in the appropriate European or International standards.

5. There shall be at least two sets of all source programs held on the agreed medium. For reasons of security one set shall be kept remote from the other(s) and regularly updated as changes are made. By agreement the NHAI or the NHAI's nominated representative may hold one set.
6. The ATMS service provider shall hold at least two sets of all operational programs including, where appropriate, site-specific data and programs held in appropriate media.
7. All programs being deployed shall be clearly identified and include the appropriate issue details and date.
8. Modular Data & API Integrations: All the data generated for incidents, violations, traffic etc as collected by various sensors will be integrated with ATMS command centre software/data. This data may be required to be shared with NHAI HQ through API in raw or aggregated format as desired through APIs.
9. NHAI may require from time to time two-way API integrations with software/apps under control of NHAI HQ. These API integrations shall be part of existing ATMS contracts at no additional cost.
10. The documentation held at site shall be fully annotated with issue number, date and section reference and shall include the following:
 - a) A concise description of the overall function of the software.
 - b) Details of the computer hardware of the system, upon which the software is installed and any proprietary software products used, including databases, operating systems and their version/issue status.
 - c) A complete list of all modules in the software with their functional description and interaction with other modules.
 - d) Clear operating instructions.

2.8 Information Security and Data Protection

1. Providers of ATMS system are required to ensure that the system being provided operates in a secure manner. The solutions offered shall be in accordance with Information Technology (Reasonable security practices and procedures and sensitive personal data or information) Rules, 2011 published vide Government of India Notification No. G.S.R. 3136 dated 11th April, 2011 or any other Government Order issued from time to time regarding security norms of video surveillance system or any other sub-system of ATMS.
2. The Service provider is expected to have familiarity with ISO 27001 or procure the necessary expertise in developing and delivering solutions in line with information system security best practice.
3. The Provider of the ATMS system shall ensure that the data collected throughout the contract period is securely kept and usage limited in purpose of that of ATMS. The SI shall be governed by the Digital Personal Data Protection Bill, 2023 and any relevant Government of India rules notified thereon.
4. The contractor shall carry out an IT security audit of the ATMS application software through STQC (Standardization Testing and Quality Certification)/CERT-In (Computer Emergency Response Team) empanelled vendors at least once in a year as per directions of NHAI from time to time.

2.9 Equipment Security

1. The contractor/concessionaire shall be sole responsible for safety of all the ATMS system, sub-system, equipments against theft, vandalism etc. Any equipment stolen/vandalised has to be replaced.
2. The contractor/concessionaire may use adequate manual safety measures or implement suitable electronic security mechanisms for same.
3. All the systems, sub-systems and equipments should be adequately insured to offset loss due to vandalism/theft etc.

2.10 Civil Design

The foundation of all the equipment shall be adequately designed as per relevant IS Codes using minimum M25 Grade of concrete and Fe500 grade steel reinforcement.

2.11 Work Area Safety and Traffic Control

2.11.1 General

- a. Obstructions and excavations in the work areas shall be adequately fenced and guarded at all times and proper traffic control devices shall be installed to protect the workers and the public. Particular attention shall be paid to the positioning of traffic barriers and traffic cones. Unnecessary blocking of traffic lanes shall not be permitted. Roads and sidewalks shall not be used for the unnecessary storage of materials.
- b. Adequate traffic control devices shall be in place before work begins and all such devices shall be removed immediately when the work is completed. As work progresses, warning devices which were appropriate at one time but are no longer applicable shall be removed immediately.
- c. Signs, lights, barriers and other traffic control devices shall be maintained in good order and in the correct position day and night. Signs shall be neat, clear and legible at all times.
- d. Compensation for meeting the requirements of this section shall be included in the various bid items and no separate payments will be made, therefore.
- e. Penalties shall be applicable as prescribed in the Penalty clause above, in case of any non-compliance or safety violation.

2.11.2 Highway Lane Closure

No lane closure shall be permitted on any road during peak hours except with prior approval of the NHAI. During non-peak hours, one or several traffic lanes may be closed provided that at least one lane in each direction is open for traffic at all times. On two-way, two-lane roads, any lane closure shall be first approved by the NHAI. Notwithstanding the provisions above, the NHAI and the police shall have the power to order the lane closure removed or to require better traffic control measures.

2.11.3 Warning Signs

- a. All work area warning signs shall conform to the requirements in the relevant regulations in India.
- b. A "LANE CLOSED AHEAD" and a "LANE CLOSED" sign shall be placed upstream of the lane closure site at a distance of approximately 100 meters and 50 meters respectively when one lane of the roadway is closed. These signs shall be placed further upstream of the work area if more than one lane of the roadway is closed.
- c. All work area warning signs shall be made of reflective sheet or material if the signs are to remain in place during hours of darkness.
- d. The design, specifications, quantity, location, placement of the Signages shall fully comply with IRC 67 2022, and/ or applicable international code.

2.11.4 Temporary Warning Flashers

Temporary warning flashers of Amber/red colour LED and minimum 500mm dia shall be used during the hours of darkness if traffic cones, barricades or other barriers are to remain in position at night. Lamps shall be kept alight at all times during the hours of darkness. The flashers shall clearly mark the site of obstructions and delineate the transition zone. Minimum 4 nos. warning flashers shall be kept alight at each such location.

2.11.5 Traffic Cones

Traffic cones and water filled barriers shall be placed on the roadway in advance of the work site to form a transition taper. The length of the transition taper shall be at least 30 meters so as to guide traffic smoothly from the full width section to the narrowed down section. Spacing between the cones shall be no more than 10 meters.

Chapter 3

Video Surveillance System/ Traffic Monitor Camera System (TMCS)

3.1 Scope

This specification lays down the general, functional and technical requirement of the Closed Circuit Television (CCTV) System to be used as a sub-system of ATMS implementation. TMCS shall include monitoring through pole mounted PTZ cameras.

3.2 Function

1. The system monitors vehicular and other road related activity along the highway stretch not more than interval of 1 km alternating side/median mounted on Poles. In case certain stretches include regular curves etc (hilly roads etc) not allowing central line of sight, then additional TMCS camera shall be put to ensure effective surveillance of the entire stretch.
2. CCTV system is required to ensure effective surveillance of the target road section and related surrounding areas and generate a tamperproof record for post event analysis.
3. The PTZ cameras shall be programmed such that they are able to cover 500m in each direction using presets.
4. This will cover the entire stretch and will be primary surveillance method. While primary usage will be manual surveillance, TMCS cameras shall have basic intelligence for "Accident Detection" and "Stalled Vehicles Detection".

3.3 Functional Requirements

1. The System shall provide an online display of video images. It shall be possible to use monitors with latest display technology or similar display devices located in ATMS Control Centre.
2. Proposed CCTV system shall follow an open standard and follow an IP based network centric architecture to provide a high-speed system implementation for best performance.
3. System shall use video signals from various types of CMOS colour cameras installed at road locations, process them for viewing on workstations/monitors at ATMS Control Centre and simultaneously record all the cameras.
4. Footage should be used to conduct automatic detection of key events which are central to incident response and road safety. These events are coarse enough to be identified through cameras even at a distance and hence separate from VIDES cameras. The key events are as follows:
 - a. Accidents (collisions, crashed vehicles, smoke etc)
 - b. Parked/Stationary Vehicles
5. It will be up to the service provider to conduct analytics on edge i.e. at the camera level and then convey the results to the command center or centrally at the ATMS software or cloud as long as events are detected automatically

and conveyed back to the ATMS software in <5 seconds of happening in reality.

6. Whenever any accident or stalled vehicle is detected by the TMCS camera the following will be sequence of events:
 - a. The camera will pause in that location for the time being.
 - b. Alarm will be initiated (audio and visual) in the command center and the view of this camera will be highlighted or brought to focus by the TMCS software.
 - c. Operator will assess the information and take action:
 - i. Accident (Notify Emergency Response teams)
 - ii. Stalled Vehicle (Dispatch RPV, zoom into number plate and record evidence (photo, number-plate etc) for appropriate action incase parking is caused by avoidable reasons.
7. Video Footages should have been compressed using H.264 (MPEG 4 part 10/AVC) standard prior to recording.
8. Any new ATMS setup shall use Digital IP cameras only. Analog CCD/CMOS cameras with external encoders are only permitted if ATMS has already been setup before issue of this circular. Analog CCD cameras should connect to a Hardware encoder through a cable and the combination shall support minimum dual streams. The hardware encoder used shall be capable of producing streams at 25 FPS for each connected camera. If the camera is IP based, it should be UTP ready. The compressed video shall be streamed over the IP network. Any new setup shall have IP cameras only. If newer technologies of camera such as cloud-first etc are available, they can be piloted at risk of the SI and demonstrate that same functionalities as required by IP Cameras are being met.
9. Encoders shall have less than 200 ms of latency and shall support dual stream- H.264 (MPEG 4 part 10/AVC) or JPEG.
10. The recording resolution and frame rate for each camera shall be user programmable.
11. Surveillance TMCS/CCTV cameras shall operate on 230 V, 50 Hz single-phase power supply. If the camera or connected accessory operates on a different voltage or frequency, necessary conversion/correction device shall be supplied along with the camera.
12. Encoders shall be POE compliant and connected to Layer 2 or Layer 3 switch as per system design using UTP CAT 6 Cable or fibre optic cable and the required connectors as per standards.
13. The encoder shall be built on embedded processor, preferably with its own RTOS and should convert Analog Composite/S-Video input into good quality digital stream on real time basis. It shall be able to transmit as Unicast/Multicast IP packet with low latency (less than 200 m.sec) for live viewing as well as for recording.
14. The minimum video resolution should be 2 MP.
15. The encoder should generate H.264 (MPEG-4 part 10/AVC) or JPEG video stream Compliant with ISO/IEC 14496-10 standard. The encoder should be interchangeable with any standard encoder of any other make, which generates H.264 (MPEG-4 part 10/AVC) video stream Compliant with

ISO/IEC 14496-10 standard.

16. PTZ cameras shall support the feature of pre-programmed tours for easy customization to cover specific points of interest in a predetermined pattern.
17. The TMCS cameras can also be used to keep an eye on the illegal encroachment, broad O&M defects as visible from cameras, plantation etc. A dedicated operator with civil engineering background shall be deployed to scan/zoom the highway to identify O&M related defects and report them to NHAI One through dedicated login prepared for ATMS provider.
18. If Vehicle has been manually identified to be driving in wrong direction (contraflow) for more than 1 km (two TMCS) cameras then command centre should immediately dispatch RPV.

3.4 Technical Requirements

1. The rated resolution should be sufficient to view the target area in acceptable detail for all cameras. Vehicle characteristics and vehicle class shall be discernible from a distance of 500 meters from the camera (at full optical zoom) in day condition atleast.
2. All cameras shall have a minimum sensitivity of 0.02 lux for colour images at a shutter speed of 1/15.
3. AGC and Auto iris combination shall provide a light range adaptation of 10000:1 or better.
4. All cameras should be rated for outdoor use.
5. All cameras shall have day-night IR filter for brilliant daytime colour and excellent night vision under low light.
6. Cameras shall have inbuilt IR illuminator of 100 meters for night vision functionalities.
7. Ability to communicate using a choice of technologies (Either Wired ether-net, WIFI, OFC, 4G/5G etc.) to allow for system scalability and smooth integration, as the communication infrastructure is changed or upgraded.
8. PTZ cameras shall allow for 360 degree pan, 2 to 92 degree tilt and at least 35x optical zoom and 16x digital zoom to provide for coverage of a wide target area and yet maintain the required image detail. All PTZ cameras shall have Closed loop speed control with Integral pan / tilt motor drive to enable smooth, precise pan-tilt for fine control and accurate tracking, even at high zoom levels.
9. All cameras shall have Flat glass window with internal heater for better optical performance in rainy, humid environments.
10. All cameras housing should be waterproof, weather-sealed and corrosion resistant.
11. It shall be ensured that the Camera mounted on the pole provides an adequately stable image up to wind speeds of 200 km / h such that a vehicle's make and model can be clearly identified on the control room display, at full zoom. Such a stable image shall also be ensured when vibrations are encountered during the passage of heavy vehicles close to the CCTV pole.

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12 CCTV PTZ (TMCS) Cameras shall comply with the following Physical and electrical specifications:

a) Image Sensor	1/3" or better
b) Active Pixels	1280(H) x 960 (V) or better (2 MP)
c) Resolution	Minimum 2 MP
d) Sensitivity	0.005 lux (B/W), less than 0.06 lux (Colour) or better
e) Focus	3.5mm to 129mm or better
f) Optical Zoom	35x or better
g) Digital Zoom	16x
h) Night Vision	upto 100m
i) Signal to Noise	> 54 dB
j) AGC	Automatic
k) White Balance	Automatic
l) Electronic Shutter	Auto/Manual, 1/1 – 1/30,000s
m) Iris Control	Automatic
n) Encoding	H.264 or H.265 or JPEG
o) Video Output	Ethernet 10/100 Base-T
p) Pan Range	0 to 360 degrees, Auto flip at 180 degrees.
q) Pan Speed	variable 0.2 degrees per sec. to 80 degrees per sec.
r) Tilt Range	+10 to -92 degrees
s) Tilt Speed	variable 0.2 degrees per sec. to 40 degrees per sec.
t) Pre-set Positions	255 minimum.
u) Housing	IP66 or better.
v) Power	230V, 50 Hz domestic supply
w) Protection	Class – D for data/signal lines and class B for power

3.5 Environmental Specifications

1. Cameras & connected outdoor equipment shall be suitable to work from - 10°C to 55°C with Relative Humidity up to 95% non-condensing. If any additional equipment(s) is/are needed to achieve this range, it shall be supplied along with the camera/outdoor equipment.
2. Camera housing shall be of IP 66 or better rating.

3.6 Testing

Since each CCTV installation is different, it would be the responsibility of the manufacturer/Service provider to demonstrate the viability of his solution with a previous work of a similar capability or a pilot on the proposed ATMS site.

3.7 Installation Requirements

1. Power shall be obtained from 230V 50 Hz mains provided on site (or from a renewable energy power supply rated for a nominal voltage of 12V DC, where ever applicable).
2. Location of CCTV Cameras shall be within the ATMS stretch as verified by NHAI's representative.

3.8 Maintenance Requirements

1. The equipment supplied shall remain operable for at least the contract period from the date of commissioning.
2. The Service provider shall undertake to support/maintain and (or) provide

spare parts till equipment reaches end of life, which shall not be less than contract period from the date of supply.

3.9 Operational Requirements

The software supplied and installed at the ATMS Control Centre to operate the CCTV systems shall be able to integrate with/Export data to and import data from the ATMS unified database located in ATMS Control Centre.

Chapter 4

Video Incident Detection and Enforcement System (VIDES) – Video Based Incident Detection and Enforcement Systems

4.1 Scope

This specification outlines the general, functional, and technical requirements for video-based incident detection and enforcement systems. The primary objective of these systems is to not only detect accidents and incidents that may lead to accidents but also issue warnings to incoming traffic and deter violators through supporting evidence for generation of eChallans. The scope of the system includes the following major functionalities:

1. Detection of accidents/incidents:

- The system should be capable of detecting accidents and incidents that have the potential to cause accidents.
- Incidents/Accidents so detected shall have the following uses:
 1. It should capture evidence to facilitate the generation of eChallans, discouraging such unsafe behavior.
 2. Immediate relay of information to associated Variable Message Signs (VMS) Flashing Lights, and the Rajmarg Yatra app should be provided to warn incoming drivers.
 3. Pop-up video feeds at the command centre and therefore allow quick dispatch of emergency response vehicles for resolution.

2. Automatic Traffic Counting & Classification:

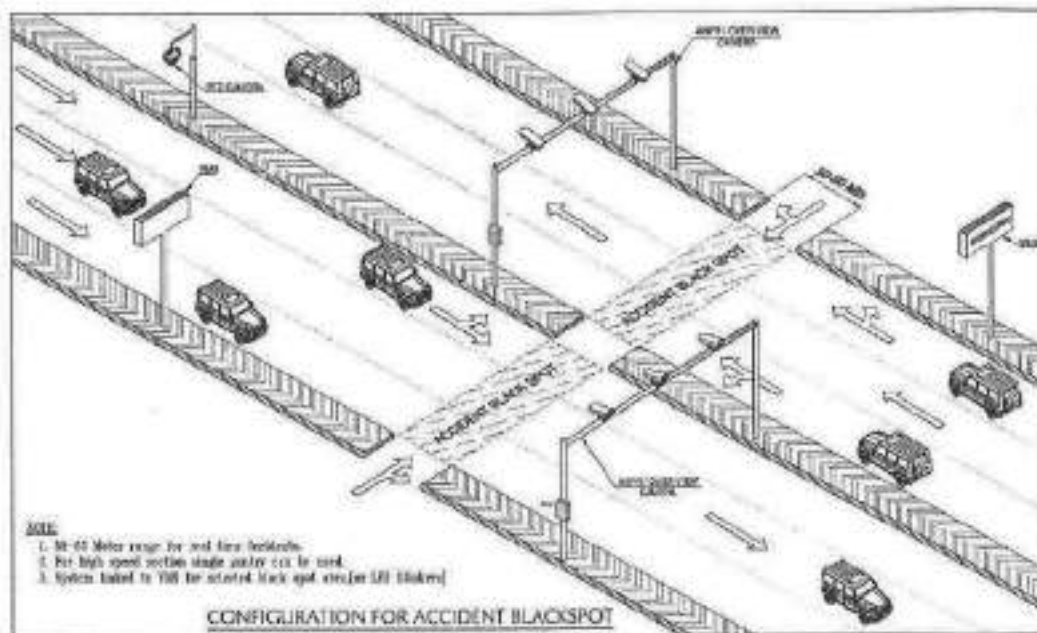
- The system should have the ability to automatically count and classify traffic, providing valuable data for traffic management purposes.

The VIDES system will include software at ATMS command centre that will allow for validating of the incidents & number plates of violators for integration with stakeholders for eChallan generation. Any incident detected should be highlighted with necessary audio/visual alarm to the operator in the command center to take appropriate action (Dispatch RPV/Ambulance etc) The system offered shall have the capability to also operate in low light conditions normally experienced during night. In very poor visibility conditions such as during winter fog/smog, the system shall detect the condition of poor visibility and generate visual alerts.

Previously, separate mechanisms were in-place for VIDES, ATCC and Vehicle Speed Detection, each getting placed separately. Current specification provides for co-locating these functionalities on single VIDES Gantry. This will allow for optimization in use of sensors, economy, prudent re-use of camera footage and ease of consolidated maintenance.

The VIDES system shall include Gantry mounted ANPR Camera(s) and Overhead Overview Camera sufficient in numbers to cover all the lanes including shoulder portion on each side of Highway. The Gantry Mounted VIDES system shall be placed

at every 10km on both side of Highways. While choosing the location of a VIDES, it should be made to coincide with highway locations such as vulnerable merger points of Service road with the main carriageway, blind corners / turns on the main carriageway, road junctions, overspeeding and incident prone areas. The setup should be on main-carriageway and looking towards incoming traffic and accident prone areas.



Setup for VIDES & TMCS at Blackspot

4.2 Function

The VIDES, essentially consisting of fixed overview camera(s), ANPR camera(s) and an attached (co-located or centralized) Video Image processing unit, shall perform real-time remote incident detection at designated spots on the highway section, record information on violators at ATMS software end for generation of eChallans and immediately provide local warning to nearby travelers / road-users on detection of relevant incidents. It shall also communicate such detected incidents to the ATMS Control Centre for storage, analysis & reporting.

4.3 Functional Requirements

1. The system shall include gantry-mounted cameras connected to a co-located or centralized/cloud video image processing modules that can detect incidents based on video analytics and automatically trigger alarms on detection to specific VMS/Lights/App and Command Centre operator. The above equipment shall be suitably mounted on full gantry. A single unit of VIDES shall consist of the following:
 - a) Video Image processing unit(s)
 - b) Overview Camera (wide-range with 60-100m viewing) with IR or Thermal or other Night Vision Mechanism for 60-100m range.
 - c) ANPR Camera (low-angle) along with IR illuminator
 - d) Distant Pole/gantry mounted flashing warning lights and/or VMS
 - e) Surge Suppressor
 - f) Audio/Visual Alerts for Operator at Command Centre to Bring Focus to camera feed

- with violation.
- g) Back-office Software for Validation of Violation data captured and integration with Enforcement Agency (eChallan/Vahaan)
 - h) All other necessary equipment for operation
2. The system shall automatically detect incidents/analysis using video analytics mentioned in 4.3.2 section:
 3. A typical setup for a particular direction will have ANPR camera(s) facing the traffic covering all lanes and overview cameras which enable viewing 60-100m in each direction covering all lanes during both day & night.
 4. A typical setup will include one ANPR camera for every lane and overview camera(s) suitably placed to cover all lanes and facing traffic in each direction. The setup maybe suitably modified depending on the situation as long as each lane is adequately covered to meet the functional requirements as per the performance standards specified in this section. The equipment setup should be designed to minimize total number of cameras/sensors/LPUs etc while maximizing the utilization of camera/sensor feeds/computation, enabling multiple functionalities without the need for separate cameras for each purpose. For eg. if SI is able to do number plate recognition across all lanes with lesser number of cameras without dip in performance and more economically, the same shall be encouraged. However, any deviation from typical setup as explained above shall require POC and prior approval of the Employer.
 5. The number of cameras & positioning of each in this system should be such that incidents are detected in both direction across all lanes and the number plate is captured for all vehicles passing under the Gantry.
 6. One complete VIDES system will comprise both LHS and RHS. To meaningfully cover a blackspot, it maybe sometimes necessary to separately position the LHS and RHS gantries but the distance should not be beyond 500 meters.
 7. On detection of an incident the system shall activate appropriate flashing lights or LED blinkers, and/or display appropriate incident message on nearby VMS to locally to warn road users.
 8. In case of VIDES placed to cover MORTH Blackspot or an emerging high-risk accident spot identified by NHAI PD, VMS will be used to issue alarms and warnings in place of flashing lights.
 9. Simultaneously the detected incidents shall be communicated to the ATMS Control Centre.
 10. The ATMS Control Centre software will be responsible for immediately and programmatically broadcasting the location and type of incident to the Rajmarg Yatra API in the standardized format. This information will be broadcasted to Rajmarg Yatra users in the vicinity of the incident. The ATMS Control Centre shall be responsible for informing the Rajmarg Yatra when the incident is no longer active as well. Basic SOP for the same as Section 10.3.6.
 11. Notwithstanding other provisions, a small video recording of select types of incidents (minimum 10 seconds before and after) will be recorded and kept at the ATMS software for at least 180 days or until SLAs have been assessed for that period, whichever is larger. In case of Accidents they will be kept for the entire period of the contract and for enforceable challans they will be kept till the data has been transferred to relevant local authority.
 12. It shall also be possible to view on-line and record at the ATMS Control Centre,

the video images from cameras belonging to the VIDES.

13. Gantry/Pole mounted flashing lights of 300mm diameter with a visibility of atleast 500m shall be used for local warning where VMS is not being used.
14. There shall be at least two such warning lights/VMS each mounted typically at a distance of 200meters and 300meters before the incident monitoring point (Gantry location) when seen from the direction of travel. The above distances shall be suitably optimized during detailed engineering.
15. The VMS shall be programmed to show appropriate message to the drivers pertaining to each incident point. Details are in 4.3.2. The specifications of VMS shall be dictated by the appropriate chapter on VMS.
16. The led blinker shall be inter-connected with the nearby incident detection system either by cable or by wireless.
17. During periods of poor visibility, as detected by the VIDES, the lights shall go into a flashing mode until visibility improves to a level for adequate incident detection.
18. The above lights shall stop flashing either on the event of the disappearance of the detected incident(s) or on the occurrence of a reset from the control room.
19. All VIDES overview feeds shall be displayed on the video-wall at all times and the VIDS software at the Command Centre shall ensure alarms related to detected incidents shall be also be enunciated on the above supervisory computer shall be audio-visual (blinking, alarms, highlighting the video on ATMS GUI etc).
20. In case internet connectivity is lost intermittently, the VIDES shall continue functioning locally; when internet connectivity is restored, the VIDES shall send the data back to ATMS automatically for processing without manual intervention

4.3.1 Video Image Processing Unit

1. The Video Image Processing Unit shall combine indoor / outdoor traffic flow monitoring and automatic incident detection.
2. The system offered shall be modular and multi-functional.
3. The Video Image processing unit coupled to the overview camera shall have the capacity to detect the presence of vehicles in the entire field of view of the camera.
4. If the service provider wants to centralize the intelligence for detection of incidents at the command centre or on cloud, they need to ensure the inference times is <2 seconds, and that the centralized software is connected to the local warnings lights/VMS for issuance of warnings for incoming traffic. Further, in case of internet connectivity is lost, incidents will be automatically processed post-facto when data is streamed back on retaining internet connectivity.

4.3.2 Incident Detection

1. The VIDES (combination of ANPR and Overview) cameras will work in tandem to cover the incidents and enforcements listed below.
2. The system shall provide detection of the following incidents:

Incident Name and Description	Proposed Primary Camera	Precision & Recall	Actionables/SLRs
<p>Accident</p> <p>Collisions of vehicles, vehicles ramming into side rails, medians, vehicles with smoke/fire coming etc.</p> <p><i>Real-time Detection & Alert (Day and night)</i></p>	Overview	<p>97% Recall</p> <p>90% Precision</p>	<p>RPV & Ambulance Dispatch</p> <p>Automated Message to VMS</p> <p>Automated Flashing</p> <p>Video to be saved.</p>
<p>Opposite Side Traffic</p> <p>Detection of vehicles coming from the direction opposite to the allowed direction of travel and vehicles traveling in a direction that is across the allowed direction of travel.</p> <p><i>Real-time Detection & Alert</i></p>	ANPR/Overview	<p>90+ Recall</p> <p>90+ Precision</p>	<p>eChallan/VMS Flashing</p> <p>Video to be saved.</p>
<p>Stalled or Stationary Vehicles</p> <p>Detection of stationary vehicles within 5sec</p> <p><i>Real-time Detection & Alert</i></p>	Overview	<p>90% Precision</p> <p>90% Recall</p>	<p>eChallan (Manual Challan as in Section 3.3.6 and Section 10.3.2)</p> <p>RPV Dispatch</p> <p>Flashing Light VMS</p> <p>Message: Caution: Parked Vehicles Ahead</p> <p>Video to be saved.</p>

Detection of fog, low visibility during day time or smoke in the view <i>Real-time Detection & Alert</i>	Overview	90% Precision 90% Recall	Flashing Light VMS Message: Caution: Low Visibility Ahead Rajmarg Yatra
Detection of debris/fall objects of size that can impact traffic or road safety. <i>Real-time Detection & Alert</i>	Overview	90% Precision 90% Recall	RPV Dispatch Flashlight VMS Caution: Drive Slowly Debris on Road
Pedestrian Crossing <i>Real-time Detection & Alert</i>	Overview	90% Precision 90% Recall	Flashing Light VMS: Caution: Drive Slowly Pedestrian Crossing.
Animals on the Carriageway <i>Real-time Detection & Alert</i>	Overview	95% Precision 95% Recall	RPV Dispatch Flashing Lights VMS: Caution: Animals Crossing. Drive Slow
Wrong Lane Driving Heavy vehicle moving in the fast lane <i>Real-time Detection & Alert</i>	ANPR	90% Precision 90% Recall	eChallan Video to be saved.
Seatbelt Violation <i>Real-time not necessary (back-office processing permitted)</i>	ANPR	80% Precision Day and Night 65% Recall except during direct sun glare on windshield, anti glare coatings etc.	eChallan Video to be saved.

No Helmet in Two Wheelers <i>Real-time not necessary (back-office processing permitted)</i>	ANPR	90% Precision 90% Recall	eChallan Video to be saved.
Triple Riding in Two Wheelers <i>Real-time not necessary (back-office processing permitted)</i>	ANPR	90% Precision 90% Recall	eChallan Videos to be saved.
Two Wheeler or other Banned Vehicles on Expressway <i>Real-time Detection & Alert</i>	ANPR	95% Precision 95% Recall	eChallan Video to be saved.
Overspeeding <i>Real-time Detection & Alert Detailed in Below</i>	Overview and/or ANPR and/or Any Other Sensors	Minimum speed of 180 kmph with 98% accuracy, Day & Night Conditions	eChallan Video to be saved.
Traffic Flow Detailed in Below Section. <i>Real-time not necessary (back-office processing permitted)</i>	Tandem		Analysis/ Messaging

3. It shall be possible to define an output for each alarm. The field electronic modules shall save images in case of alarm and send them to a server in the ATMS Control Centre. Such an image sequence shall consist of number of images with the pre-incident information and number of images with the post -historical incident information. In addition to the above it shall also provide following alarms:

- Video quality bad / low
- No video signal
- Communication problem

4. In the event of communication problem with the central server the incidents

shall be saved on the local field electronic module.

5. The central server shall clean the data on the local module once the details are transferred on to the server.
6. This Video Image Processor-Incident Monitor shall combine traffic incident detection and traffic flow monitoring in one single field electronic module.
7. There shall be facility during set-up, for alarms to be enabled or disabled for a specific type of traffic flow (e.g. no stopped vehicle alarms during queue conditions).
8. Each camera shall be calibrated specifically for the scene (lanes, junctions etc)
9. It should be possible to continuously (remotely or otherwise) update the cameras with improved AI models and with newer incident types if required by NHA without any physical changes in the setup.

4.3.3 Flow Monitoring

1. The system shall be able to distinguish between minimum 5 types of traffic flows (levels of service) based on flow speed and zone occupancy.

4.3.3.4 ATCC

1. The ANPR cameras monitoring every lane shall be use for Automatic Traffic Counting and Classification.
2. Each Vehicle Passing from under the Gantry shall be recorded by the ANPR camera. The same will be used to classify the vehicle that is passing.
3. The indicative classification of common vehicles for the ATCC is given below:
 - a. Two Wheelers
 - b. Three Wheelers (Auto/Tempo)
 - c. Four Wheelers (Cars, Jeeps, Vans etc)
 - d. Light Motor Vehicles
 - e. Trucks/Buses
 - f. Multi-Axle Vehicles
4. The ANPR cameras shall be classifying vehicles in any case for speed violation and other incidents.
5. The vehicle wise traffic data from each Gantry shall be stored in a relational database in the command centre for a period of 180 days or until SLAs have been assessed for that period, whichever is larger. (Vehicle Type, Number Plate, Date/Time etc). Photo is only saved if any violation has been detected.
6. The data shall be passed to PD or representative of NHA or IHMCL for comparison with data as received from NPCI for toll-collection on that stretch and identify vehicles that were identified using ATCC to be on the stretch but not found on that days transaction data from toll-plaza.
7. The ATMS software shall also identify vehicles whose Class as identified by the camera visually don't match the Class returned from the NPCI FASTag mapper API. These violations shall be passed on PD or IHMCL for further

action.

4.3.3.5 Speed Detection

1. VIDES shall be able to do both spot speeding and section based speeding during the day and night. Spot based speeding means estimating the speed of the vehicle in the immediate area the Gantry is looking at and section based speeding will be calculating the average speed of the vehicle based on the time it takes to travel between two VIDES gantries every 10 km.
2. The speed violation detection technique should be aligned with relevant MORTH and Traffic Police guidelines and notifications.
3. The accuracy of the speed detection technique should be 98% and capture up to minimum 160 kmph speeds during day and night for all types of vehicles.
4. Solution provider may employ visual speed detection (entry/exit frames) using cameras or through other sensors (radar etc) – choosing whichever is able to meet functional requirements the most economically.
5. The system should be able to differentiate/mark between multiple vehicles even if parallel driving, tail-gaiting, crowding etc and measure speeds for more than 90% of the vehicles passing under the Gantry.
6. Evidence collected during speed detection should be such that can stand scrutiny of court of law on challenge for both spot and section based speeding.
7. System shall be capable of enforcing separate speed limits for vehicle types. The Service Provider shall seek the specific speed limits to be enforced for the stretch from the NHAI PD in writing.
8. Section Based Speeding: If Vehicle A is at VIDES Gantry at time-stamp t0 and reaches VIDES Gantry at time-stamp t1, the average speed of the vehicle is distance between the two gantries divided by the time-taken by the vehicle between the two Gantries. This would mean that the ANPR cameras will be capturing the license plates of all vehicles and not just limited to the ones breaking spot-incidents mentioned in 4.3.3.2. If the average time so calculated is over and above the prescribed speed limit for that vehicle type for this highway, then this shall be considered an enforceable violation for purpose of eChallan.
9. The speed enforcement mechanisms shall be calibrated to the satisfaction of the local enforcement stakeholders [Traffic Police etc] and conformance to 167A of Motor Vehicle Act.

4.4 Video Camera (Overview)

- 1) The unit shall be a high resolution, 1/3 image format CMOS camera, designed for professional video surveillance systems. Incorporating the latest in technology, the video camera shall provide detailed video without lag, image retention, or geometric distortion.

The camera shall have great low light sensitivity, electronic shutter, automatic

gain control and back -light compensation to enable camera to operate in wide range of lighting conditions. Apart from visual sensors, the camera shall accompany infrared illuminators or thermal sensors to ensure Overview Camera related incidents (debri, fog, accidents, pedestrian, animal crossing etc) are automatically detected in night conditions also in the range of 60-100m.

- 2) The IP Camera shall have the following specification:

a.	Rated input voltage	230 VAC, 50 Hertz
b.	Imager	Interline transfer 1/3" format CMOS
c.	Sync. System	Internal with Crystal External with Mains Synchronization or better
d.	Active picture elements	2 MP or higher if needed to meet functional requirements.
e.	Signal to noise ratio	>50 dB minimum
f.	Minimum Illumination	0.15 Lux (F1.2 , AGC On) at 50m IRE
g.	Electronic Shutter	Manual: 1/50 to 1/10000 sec. 8 selections possible. Automatic: AES 1/50 TO 1/100000 Sec.
h.	Back Light Compensation	6 Zones or through better technologies.
i.	Camera Text in Picture	16 Character title anywhere on screen.
j.	Encoding for integration with the ATMS control centre	H.264 (MPEG-4 Part 10(AVC)/)PEG
k.	Night Vision Capabilities	Through IR or Thermal or any other methods as long as Functional Requirements are met in the most economic manner.

Note: The bidder/SI may also offer a CCTV Camera system with a built-in Video analytics feature meeting the requirements.

4.5 ANPR Camera

- 1) Each Lane will have an ANPR camera facing the traffic flow including hard shoulder. If there are camera configuration where less number of cameras can more economically cover all lanes and specified functional requirements, the same may be utilized after PDC with prior approval of the Employer.
- 2) ANPR cameras will capture the number plate of every vehicle passing under the gantry irrespective of whether any spot incident has been detected.
- 3) The ANPR camera should correctly link the vehicle number plate with the any incident (speed etc) as detected by the overview camera. They shall be operating in tandem where required.
- 4) The ANPR camera shall be able to capture both retro & non-retro reflective license plates.
- 5) The ANPR camera will identify incidents itself suitable for its viewing angle (seat belt, triple riding, no-helmet etc)
- 6) Success rate of ANPR shall be more than 90% during day/night time and capture plates from vehicles (including two-wheelers) with speeds up to 180 KMPH for standard or near-standard number plates. The solution provider will improve the model through the operation period to satisfactory levels and changing number plate designs.

- 7) The ANPR camera shall be able to function in adverse weather conditions.
- 8) In case ANPR is unable to recognize the plate for a vehicle, the image will be captured by the software for manual number plate recognition. No predictions or low confidence recognitions will be manually annotated by staff at the command centre and fed back to improve the model. The software at the command centre will allow command centre operator to zoom in, correct number plate recognized from the snapshot.
- 9) Each challan related number plate recognition will be manually vetted by the command center staff before handing over to local enforcement agency.
- 10) The software and cameras should be calibrated and tested on a monthly basis by the proposed representative of NHAI.
- 11) The associated command centre software should have provision for being loaded with number plates alarms for stolen vehicles, hotlist etc and immediately notify traffic operator such that the operator can communicate the same to the police/enforcement agency.
- 12) The IP Camera shall have the following specification:

a.	Rated input voltage	230 VAC, 50 Hertz
b.	Imager	Interline transfer 1/3" format CMOS with Full HD with Global Shutter
c.	Sync. System	Internal with Crystal External with Mains synchronization
d.	Active picture elements	2 MP Per Lane of Coverage by Camera (Eg. If a Camera is to serve more lanes, higher MP to be used accordingly)
e.	Signal to noise ratio	>50 dB minimum
f.	Minimum Illumination	0.15 Lux (F1.2 , AGC On) at 50m IRE
g.	Electronic Shutter	Manual: 1/50 to 1/10000 sec, 8 selections possible. Automatic: ABS 1/50 TO 1/100000 Sec.
h.	Back Light Compensation	6 Zones or through better technology
i.	Camera Text in Picture	16 Character title anywhere on screen.
j.	Encoding for integration with the ATMS control centre	H.264/JPEG (MPEG-4 Part 10(AVC))
k.	Night Vision Capabilities	IR Illuminator

4.6 Housing

Camera housing should have IP66 rating and following specifications:

- a) Camera mounting site requirement Vandal-proof wall/pole/corner/hanging mount as per requirement
- b) Cable entry IP66 compliant cable pass-through
- c) Finish Off-white semi-gloss
- d) Construction Aluminium or engineering plastic with optically clear UV protected polycarbonate dome.
- e) 24*7 fan assisted thermostatically controlled Heater/defogger/forced air cooler

4.7 Environmental Requirements

1. Cameras & connected outdoor equipment shall be suitable to work from -10°C to 55°C with RH up to 95% non-condensing. If any additional equipment(s) is/are needed to achieve this range, it shall be supplied along with the outdoor equipment.
2. Equipment housing shall be of IP 66 or better rating.

4.8 Testing

Since each installation is different, it would be the responsibility of the Service provider to demonstrate the viability of his solution with a previous work of a similar capability or a pilot on the proposed project site.

4.9 Installation Requirements

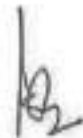
1. Power shall be obtained from 230V 50 Hz mains provided on site (or from a renewable energy power supply rated for a nominal voltage of 12V DC, where ever applicable).
2. Location of CCTV based VIDES shall be within the project highway stretch.

4.10 Maintenance Requirements

1. The equipment supplied shall remain operable for the contract period from the date of commissioning.
2. The Service provider shall undertake to support/maintain the equipment till the completion of the contract period.

4.11 Operational Requirements

The software supplied and installed at the ATMS Control Centre to operate the CCTV-based VIDES shall be able to integrate with/Export data to and import data from the ATMS unified database located in ATMS Control Centre.



Chapter 5

Vehicle Actuated Speed Display

5.1 Scope

This specification lays down the general, functional and technical requirement of the radar based Vehicle Actuated Speed Display to be used as a sub-system of ATMS implementation. The VASD system shall include gantry mounted Radar and Speed Display system to warn the road users. These speed displays shall be installed to warn road users of over speeding and thereby acting as a deterrent. They shall also have the capability to collect and relay real time data for subsequent analysis in the ATMS Control Centre. Eg. Which VASD locations are we seeing constant over-speeding or under-speeding in the fast lane. VASD in itself will not include any enforcement mechanisms other than showing users their speed and whether it is beyond limit or within limit.

5.2 Function

The speed display shall provide textual or graphical warning to the vehicles exceeding the preset speed limit. The present limits can vary by lane. VASD comprising Display and Radar will be placed at every 20 km subject to minimum 2 in every Project Package. The positioning of this should be such that it is considerably separately from the VIDES Gantries as they are for enforcement while VASD are for warnings only.

5.3 Functional Requirements

1. The system shall perform during day and night as well as in adverse weather conditions.
2. It shall have built in diagnostic functions to quickly assess the validity of speed calibration.
3. It shall adjust display intensity automatically to suit the ambient light conditions.
4. It shall be modular in construction for ease of maintenance.
5. It shall display numeric speed data as well as graphical (standard IRC road warning sign) (preferably) / textual warning.
6. Measurement:
 - a. Speed range : 1 km/h to 200 km/h
 - b. Maximum Measuring errors: Up to 100 km/h $\rightarrow \pm 3$ km/h, Above 100 km/h $\rightarrow \pm 5$ km/h
 - c. Minimum Monitored section length : 500 m

5.4 Technical Requirements

1. The speed display shall be formed using individual modules.
2. Speed display must be constructed using corrosion resistant panel with LED pixels in row: column matrix.
3. Scanning/Multiplexing ratio shall be 1/8 or better.
4. The LED Cluster shall consist of individual LED's rated for out-door use.
5. Shall support an industry standard communication interface such as TCP/IP on copper, Wi-Fi, and/or fibre optic to help setting the preset speed and retrieve log data.

6. Shall maintain time stamped record (speed and vehicle image) of each case of over speeding in a log file that can be retrieved over the connected network or using a locally connected laptop.
7. It shall optionally be possible to configure the display to send real time violation event record (speed, vehicle image and time stamp) over the connected network while recording the same.
8. It shall be possible to control the brightness of displays automatically using built-in light sensors.
9. All PCB's shall be of FR4 material, 1.6mm thick and LED matrix PCB shall be 2.4mm thick. PCBs shall be of the quality suitable for use in environment conditions specified.
10. The equipment shall allow local diagnostics via laptop connected to its communication port.
11. Fault diagnostics shall be provided to include the following as a minimum:
 - a) Camera Failure
 - b) Radar Failure
12. The equipment shall comply with the following Physical and electrical specifications:

Function	Specification
Display size in inches	15 high x 8 width per digit or character
Viewing Angle	15 to 30 degrees
Color and Wavelength (nm)	Red (625), Amber (590), Green(525)
Luminous Intensity	7500 candela per meter square.
Power Feed	230V AC @ 50Hz, with Battery backup and preferably solar chargeable
Mounting	Fixed over existing gantry or a separately erected pole
Humidity	0 to 95% Non-Condensing
Operating Temperature (Ambient)	-10°C to 55°C
Construction	Weatherproof outdoor non sealed ventilated
Communication	Ethernet or Copper, Fibre, Radio (3G/GPRS, blue-tooth and Wi-Fi)
Protocol	TCP/IP, NTCIP, SNMP
Operation	Software for VAS display sign configuration and log file retrieval.

5.5 Environmental Specifications

The VAS shall meet the following climatic and environmental requirements:

SN	TEST	REFERENCE
1.	Change of temp test	IS 9000 Part XIV Sect. II
2.	Dry heat test	IEC-571; IS: 9000 Part-III Sect.3
3.	Cold test	IS 9000 Part II Sect. III
4.	Damp heat test (Cyclic)	IS9000 Part V Sect. 2 Variant 1
5.	Damp heat test (Steady state storage)	IS9000 Part IV
6.	Salt mist test	IS9000 Part XI procedure 3
7.	Dust test	IS 9000 Part XII
8.	Bump test	IS 9000 Part VII Sec. 2

5.6 Testing

The equipment shall be tested for functional requirements as below:

1. Speed limit shall be programmed using the provided software over the networker through a locally connected laptop terminal, as the case may be.
2. Brightness of pixels, ambient light sensor, radar accuracy and false positives.

5.7 Installation Requirements

1. Power shall be obtained from 230V 50 Hz mains provided on site or from on-board solar chargeable batteries.
2. Solar panels (if supported) shall be installed on the same fixture as the display(pole or gantry)
3. Location of speed display shall be within the project highway stretch.

5.8 Maintenance Requirements

1. The equipment supplied shall remain operable for at least the contract period from the date of commissioning.
2. The Service Provider shall undertake to support/maintain the equipment till the completion of the contract period.

5.9 Operational Requirements

1. The software supplied to configure and retrieve logs shall export data that would integrate with ATMS unified database located in the ATMS Control Centre.

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Chapter 6

Emergency Roadside Telephone System

6.1 Scope

This specification lays down the general, functional and technical requirement of the Emergency Roadside Telephone (also referred to as Emergency Call Box) to be used as a sub-system of ATMS implementation. The term "Emergency Roadside Telephone" or the term "Phone" covers the phone instrument, mounting hardware, pole or any other mounting structure along with grouting, the charging stations, secondary power source such as the batteries, and the solar modules in case the units are solar charged. The ECBS are advised to be installed on all access controlled Highways and Hilly roads at an interval of every 2 kms. For all other Highways, requirement of the system may be assessed by NHAI and system may be de-scoped as per provision of the Contract.

6.2 Function

Emergency Roadside telephones are to be used by the road users to make emergency calls to the local ATMS Control Centre to report incidents such as accidents and /or other emergency situations on the highway requiring immediate help / intervention.

6.3 Functional Requirements

1. Suitable for working on a Fibre Optic / dedicated copper transmission/ wireless network as per requirement.
2. Built-in speaker and microphone for hands-free operation.
3. Clearly labelled and distinctly identifiable "activate" button to initiate communication.
4. Audio and visual indication of communication status such as call placed, call acknowledged at the control centre, call in progress, or call on hold.
5. Multiple numbers shall be programmed (at least three) into the device so that incidents of line busy are minimized.
6. The unit shall dial each number in sequence automatically till the line is connected or call is cancelled by the road user.
7. Shall provide a means to record the message in case all the lines are busy.
8. Provision to operate the phones in case of primary power failure. Batterybacked power source shall be used and preferably, it shall be solar charged.
9. The ERT Phones shall operate in duplex mode.
10. The ERT Phones shall have the front facia suitable for rugged outdoor use.
11. The ERT phone shall be designed to provide the following operation related functions:
 - 11.1 The user will push the call button to initiate a call from the phone.
 - 11.2 The calling user shall hear a ring tone if the call is successfully initiated. Alternatively if the line is busy, a busy tone accompanied by



a voice message both in English, Hindi & Local language shall sound. When the system is not functioning a suitable message shall sound along with a distinctive tone that is other than the ring tone or the busy tone.

- 11.3 The phone units shall have self -diagnostics to test themselves for correct operation. Any malfunction detected shall be reported to the control room system immediately along with the nature of the fault.
- 11.4 A scheduled test of all phone units shall be performed at regular intervals for correct operation of speaker and microphone.
12. The ERT system shall have automated start-up ability in the event of power outage and restoration.
13. All Alarms, results of self-diagnostics tests and data related to the ERT system shall be logged to a central database. Attempted damage as detected by the anti-tampering sensor shall be recorded separately for quick access.

6.4 Technical Requirements

1. Echo cancellation should be implemented in the phone.
2. The design should consist of a single PCB and minimal serviceable parts.
3. To prevent vandalism it is essential that the components and PCB shall not be usable as a regular phone even after modification.
4. The phones shall be remotely configurable using software at the control centre.
5. The phones shall also be locally configurable using a laptop and provided software.
6. The phones shall remain operable up to a noise level of 95dB
7. If using cables, there should be at least 20% spare capacity to replace faulty pairs without laying additional cables.
8. Configuration, Diagnostics and other communications shall not interfere with the voice communications. These signals and their significant harmonics should be beyond the audible range.
9. Protection from ESD and lightning should meet or exceed class - D for data lines and class - B for power lines.
10. Remote fault diagnostics shall be provided to include the following minimum:
 - a) Power Failure/low/high voltage at Phone site
 - b) Voice data transmission/reception/communication failure detection.
 - c) Correct operation of speaker and microphone.
 - d) Crosstalk detection.
 - e) Storage battery condition information.
11. The ERT phone shall have a front panel locking arrangement which shall require a special tool / key to access the door.
12. In the event of any tampering (e.g. door open condition) the Emergency Roadside telephone shall generate an automatic electronic signal that can be detected and displayed (in the form of an audio-visual alarm) at the ATMS Control Centre.

6.5 Environmental Specifications

1. The housing shall be fibre-reinforced plastic sporting a prominent colour that can be easily recognized by road users.
2. The housing shall meet or exceed IP65 standards of water ingress protection.
3. Operating Temperature -10 °C to +55 °C

4. Relative Humidity: Up to 95 % (Non-Condensing)
5. The electronic subassemblies shall be certified to meet or exceed the followingspecifications:

SN	TEST	REFERENCE
1.	Change of temp test	IS 9000 Part XIV Sect. II
2.	Dry heat test	IEC-571; IS: 9000 Part-III Sect 3
3.	Cold test	IS 9000 Part II Sect. III
4.	Damp heat test (Cyclic)	IS9000 Part V Sect. 2 Variant 1
5.	Damp heat test (Steady state storage)	IS9000 Part IV
6.	Salt mist test	IS9000 Part XI procedure 3
7.	Dust test	IS 9000 Part XII
8.	Bump test	IS 9000 Part VII, Sec. 2
9.	Vibration test	TEC (IPT 1001A revised)

6.6 Testing

The equipment shall be tested for functional requirements as below:

1. Earth continuity
2. Insulation resistance
3. Call from phone to operator - Ringing tone
4. Check for the speech path
5. Check for hold tone
6. Check for busy message
7. Check for call back facility from operator station to phone
8. Check for phone test facility from operator station
9. Check for Programming of ECB address
10. Check for Tamper alarm

6.7 Installation Requirements

1. Zones of Telecommunication black spots shall be identified on the project highway for locating the Emergency Roadside Telephones(ERTs)..
2. On longer (> 2 km) stretches suffering from telecommunication blackspots, ERTs shall be installed at intervals of 2 Km (+/- 100m) on both sides of the highway such that a distance of 1km (+/- 50m) is the maximum one has to travel to reach the nearest available ERT..
3. Power shall be obtained from Solar PV charged on-board batteries rated to operate the phone for a minimum of 3 days in the absence of adequate solar radiation..
4. Solar panels and chargers (if applicable and supplied) are to be installed in accordance with the site requirements.
5. The ERT phone shall be installed 2 meters away from the edge of the hard shoulder. It shall be mounted on a metal pole with a base that shall be grouted over a 1 m X 1 m X 0.3 m concrete platform provided with a handrail (with a suitable access opening) for protecting the user from vehicular collision. Further the direction of the ERT phone shall be such that the user can have a clear view of the arriving traffic during access and use of the phone. Further a minimum length of 10 meters of crash barrier shall be installed for protecting the ERT phone location from arriving traffic.
6. Illuminated guide signage shall be placed approximately 50 metres and 10 meters on either side of the phone.
7. Suitable mounting fixtures such as poles and other suitable/related equipment

shall be supplied and installed by the service provider.

6.8 Maintenance Requirements

1. The equipment supplied shall remain operable for at least the contract period from the date of commissioning.
2. The Service provider shall undertake to support/maintain the equipment till the completion of the Contract period.

6.9 Operational Requirements

The software supplied and installed at the ATMS Control Centre to operate the facility shall be able to integrate with/Export data to and import data from the ATMS unified database located in ATMS Control Centre.

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Chapter 7

Variable Message Sign (VMS)

7.1 Scope

This specification lays down the general, functional and technical requirement of the Variable Message Signs (VMS) to be used as a sub-system of ATMS implementation. VMS shall include both Fixed (L & M Gantry) and Portable variable message signs including the trailer & anchoring mechanisms (for the Portable VMS).

7.2 Function

The VMS shall provide road users advance information of road conditions ahead and shall be controlled from the local ATMS Control centre. VMS system is one of the important and effective tool to manage traffic in response to road incidents, special events and construction or maintenance activities on the road. When drivers are to be warned of an incident, advised to opt for an alternate route, guided to reach a specific location or clear a lane as a response to an incident, the message posted should be appropriate and precise. The messages and the procedure for displaying them should be such that the information is grasped by a driver whose primary focus is driving his vehicle while ensuring his and his co-passenger's safety.

VMS boards envisaged are of 2 types: (i) Fixed VMS, and (ii) Portable VMS. The main function of a fixed VMS (located at the entries to the highway and typically before major junctions leading to alternate routes) is to display highway status and travel guidance information and warn vehicles of traffic congestion in the cities / villages immediately ahead. The Portable VMS (to be temporarily commissioned near the incident location) will be used to warn road users of road works and incidents that affect traffic flow. Portable VMS shall be mounted at the back of mobile vehicle to show the sign of 'men at work' and / or speed limits in the construction zone and / or traffic lane restrictions. These shall be powered by solar energy and / or battery.

Under no circumstances shall VMS be used for advertising of any kind. It would be in a blank mode when traffic, roadway, environment or pavement conditions or public service announcements do not warrant the display of message or messages.

7.3 Functional Requirements

1. A VMS message should be effective. To ensure effective messages, the messages themselves:
 - a) Shall fulfil a purpose
 - b) Shall command a short-span but definite attention.
 - c) Shall convey information that is unambiguous and simple to comprehend.
 - d) Shall aim to elicit a definite and desired response from the driver
 - e) Shall be displayed early enough to provide adequate time to respond to the event.
2. The display procedure shall be such that:
 - a) The message accuracy is authenticated.
 - b) Relevance of the message is maintained by continually monitoring the incident and updating the display.
 - c) Avoid stating the obvious.
 - d) Credibility of the information is maintained and ensured.

3. Should have procedures to post alter, and delete messages interactively to ensure message relevance and credibility.
4. Should have an intuitive user interface for the operator to learn, operate and manage the system.
5. Should be modular in construction for ease of maintenance.
6. The VMS should have sufficient graphics capability to display multi-lingual messages (English, Hindi and the local language that will be specified by NHAI) and standard IRC road signs.
7. The modules shall be field replaceable.
8. The system design shall be such so as the display is legible from a distance of at least 250 metres.
9. Integration with adjacent VIDES for automated messages for select incident/accident types.

7.4 Technical Requirements

1. The display board shall be formed using individual modules.
2. Display panel must contain a corrosion resistant panel with LED pixels in row:column matrix (Full Matrix display).
3. Scanning/Multiplexing ratio shall be 1/8 or better.
4. The LED Cluster shall consist of individual LED rated for out-door use.
5. Failure of one Text row shall not affect the Other Rows. It shall also be possible to query the status of each row to determine its health and configuration status.
6. Shall use Unicode to display messages in English, Hindi and a selected local language.
7. Shall have built in test and monitoring facilities to ensure data integrity of the messages.
8. Shall adjust display intensity automatically based on ambient light conditions to ensure readability at all times.
9. The display background should be non-reflective and the display should be U.V. resistant. Shall support multiple industry standard communication interfaces, minimum being RS-422, TCP/IP on copper, Wi-Fi, and optionally fibre optic.
10. Shall support at least the NTCIP and any one of defined and documented communication protocol[s] such as NMCS2, MESSAGE CONTROL, TR2070D, Version 2 or other equivalent international protocol.
11. It shall be possible to control the brightness of displays automatically using built-in light sensors or remotely through the provided VMS control software.
12. All PCB's shall be of FR4 material, 1.6mm thick or better and LED matrix PCB shall be 2.4mm thick. PCBs shall be of the quality suitable for use in environment conditions specified.
13. The controller shall allow local diagnostics via laptop connected to its communication port.
14. The equipment shall comply with the following specifications:

a) Length (minimum)	1650 +/- 100 mm for Portable VMS Trolley Mounted
b) Height (minimum)	1000 +/- 100mm for Portable VMS Trolley Mounted
c) Length (minimum)	2400 +/- 100mm for L Type Fixed VMS
d) Height (minimum)	1500 +/- 100mm for L Type Fixed VMS
e) Length (minimum)	5000 +/- 200 mm for M Type Full Fixed VMS
f) Height (minimum)	1800 +/- 200 mm for M Type Full Fixed VMS
g) Depth (minimum)	200 mm (for all types)

15. Fault diagnostics shall be provided to include the following as a minimum:
- a) Power Failure at VMS
 - b) Processor PCB Failure
 - c) Display Line Failure
 - d) Incoming data reception/communication error detection.
 - e) Temperature within the enclosure information.
16. The technical specifications of VMS shall be as per the provisions given in latest edition of IRC 67 and IRC SP 85
17. VMS shall be provided at the start and the end of the project (Full Gantry), blackspot locations (L Type), junctions with NH/Expressway (Full Gantry) or any other location specified in the contract/Concession agreement. Minimum 2 Trolley Mounted Portable VMS shall be provided in each Project.

7.5 Environmental Specifications

The VMS shall meet the following climatic and environmental requirements:

1. Operating temperature: -10°C to $+55^{\circ}\text{C}$
2. Relative Humidity: Up to 95 % (non-condensing)

SN	TEST	REFERENCE
1.	Change of temp test	IS 9000 Part XIV Sect. II
2.	Dry heat test	IEC-571; IS: 9000 Part-III Sect 3
3.	Cold test	IS 9000 Part II Sect. III
4.	Damp heat test (Cyclic)	IS 9000 Part V Sect. 2 Variant 1
5.	Damp heat test (Steady state storage)	IS 9000 Part IV
6.	Salt mist test	IS 9000 Part XI Procedure 3
7.	Dust test	IS 9000 Part XII
8.	Bump test	IS 9000 Part VII, Sec. 2
9.	Vibration test	TEC (IPT 1001A revised)

7.6 Testing

The equipment shall be tested for functional requirements as below:

1. Messages shall be displayed using the central software & local terminal
2. Fault conditions shall be simulated. Messages / fault logs shall be checked for:
 - a. Text Row Fault
 - b. Communication failure
 - c. Power failure
 - d. Brightness of Pixels
 - e. Rear Door open

7.7 Installation Requirements

1. Power shall be obtained from 230V 50 Hz mains / UPS/ Diesel Generator Set provided on site or from on-board lead-acid automobile batteries rated for a nominal voltage of 12V DC (for mobile VMS). If powered from an UPS the source of charging shall be preferably a renewable energy source (e.g. Solar PV, wind etc)
2. Fixed VMS shall be mounted on a sturdy and aesthetically pleasing gantry structure whereby the vertical clearance of at least 5.5m is available from the

road.

3. Safety barriers shall be provided at gantry support column(s) for their protection and for safety of road users.
4. The structure on which the VMS is mounted shall be sturdy and capable of bearing wind loads up to 200 kmph.
5. The concrete pedestal for support column should be flushed with ground but in no case should protrude more than 1.5m.

Minimum distance of VMS on expressways should be 1.5 km prior to decision point and that for National Highways it should be 1 km. The signs should be visible from a distance of 250m. It should not be located on a curve and on a highway sections having grade exceeding 4 percent.

7.8 Maintenance Requirements

1. The VMS and its sub-systems shall test/diagnose on a regular basis as well on request & log event of any problem for each individual equipment. Such problems shall be automatically flagged at the ATMS control centre and also logged in the ATMS server.
2. The equipment supplied shall remain operable for at least the contract period from the date of commissioning.
3. The Service provider shall undertake to support/maintain till the completion of the Contract period.

7.9 Operational Requirements

The software supplied and installed at the ATMS Control Centre to operate the VMS shall be able to integrate with/Export data to and import data from the ATMS unified database located in ATMS Control Centre.



Chapter 8

Mobile Radio Communication System (MRCS)

8.1 Scope

Mobile Radio Communication system should be capable of providing wireless communication between ATMS Control Centre and Vehicle Mounted Units & Handheld units for Emergency response as well as routine Operations & Maintenance activities for the Highway.

The Mobile Radio Communication system should have Vehicle mounted units fitted on ambulances, Cranes and Patrolling Vehicles for facilitating instant communication even when these are on the move across the highway. In addition handheld radio units will also be required for Maintenance activities on the highway. The vehicle mounted & handheld units shall communicate with the ATMS Control Centre as well as amongst themselves. The ATMS Control Centre besides having base/repeater Stations and Control equipment should have a provision for a voice logger to be attached with it for recording all communication. The MRCS are advised to be installed on all access controlled Highways and Hilly roads at an interval of every 2 kms. For all other Highways, requirement of the system may be assessed by NHAI and system may be de-scoped as per provision of the Contract.

8.2 General Requirements

The Mobile Radio communication system should be designed/engineered and implemented in such a way so as to have 99% of the highway area covered with coverage reliability of a minimum 95%. The system should provide crystal clear, static free communication even for vehicles moving at high speeds. The system should be based on a state of the art Digital technology. Ability of the system to operate in mixed (analog and Digital) mode, though not mandatory shall be desirable for reasons of additional flexibility. The System should be modular in design to aid quick diagnosis and efficient onsite maintenance. The systems shall neither induce radio interference to affect functioning of other telecom equipment in proximity, nor be susceptible to interference from adjacent mounted radio equipment. Each unit shall be uniquely addressable, and preferably, be ESN validated. Mobile Radio base station unit installed at the ATMS control center shall seamlessly integrate with the co-located Emergency Response integrated audio communication unit.

8.3 Technical Requirements

All components used in the assembly of equipment shall be of industrial grade specification. The equipment shall conform to ETS European standards and shall be suitably protected through shielding/grounding against external EMI/ESI Interference, and shall be immune to RFI, ESD and lightning. Detailed technical requirements of the Base unit (Repeater and base station) as well as the field unit (Hand held and vehicle mounted) of the Mobile radio system are as under:

Repeater/Fixed Base Station

1. The Base unit shall include a controller for switching and control function.

2. The Base unit shall connect to other repeaters if need be.
3. The Base unit shall have call logging and airtime accumulation facility.
4. The Base unit shall be configurable through the installed software on a locally connected computer or over a TCP/IP link.
5. The system shall have capability to interface with the Public Switched Telephone Network (PSTN) for enabling remote access as well as Mobile/Handheld to telephone calls and vice versa.
6. It shall not be possible to program the repeaters without a hardware security lock.

Handheld/Vehicle Mounted Radio

1. The field unit shall have an alphanumeric display.
 2. The Vehicle mounted radio shall support integration of GPS.
 3. It shall not be possible to program the radios without software security key.
 4. The radios shall have a Data Messaging Capability and shall have facility to receive and send pre-defined status messages (at least 12 Character Messages).
 5. The radios shall have the facility to store at least 24 addresses.
 6. At least 16 status messages shall be selectable in the radio for sending to the other radios.
 7. The caller shall be identifiable through display of the PTT ID (of the radio sending the message) on the display of the radio receiving the message.
 8. The radios shall have the capability to receive Short Messages (at least 40 Characters) from a Control centre.
 9. The radios shall have enough memory to store minimum 6 received Status messages along with the sender's ID and 2 nos. Short Messages received along with the sender's ID.
- 11.4 Functional Requirements

The system shall satisfy the following functional requirements:

1. The radio shall support a broadcast call or a group call or an Individual Call.
2. It shall be possible to establish an ATMS to field unit link, field unit to ATMS link or field unit to field unit link for communication, as the need arises.
3. The mobile radio system shall be integrated via the Fiber optic communication system (e.g. Inter-tower communication).
4. The system shall have the facilities for waiting calls, holds calls and transfer calls.
5. Call queuing shall be supported in case all communication paths/ channels are busy.
6. Shall support multiple priority levels with pre-emption.
7. Field unit to field unit calls shall auto-terminate if either of the party hangs up or the ATMS control centre initiates a call to one of the parties or the conversation exceeds 5 minutes.
8. Late entry feature
9. It shall be possible to bridge the regular PSTN network to the mobile radio network in case of emergencies.
10. Base unit installed at the ATMS control center shall be capable of processing at least 3 calls simultaneously.
11. In case of emergency, it shall be possible to exchange quick, short status/alarm messages.
12. The system shall have suitable voting system to select the better signal at base stations as well as mobile units.
13. Selection, positioning, planning and installation of equipment shall ensure that a localized failure does not collapse the entire communication. Redundant paths shall ensure near total coverage even in such cases.
14. The system shall use frequencies to be obtained by the ATMS Service Provider from WPC in the complete stretch as per scope.

15. The system shall be protected against any damage due to power supply fluctuations, transients and surges.
16. Frequency & Power output Specifications

Sr. No.	Items	UHF	800 MHz
1	Frequency band	400-430 MHz or	806-825 MHz Base Station RX
		450-480 MHz or 480-512 MHz	851-870 MHz Base Station TX
2	Power Output		
2.a	Maximum power output of Base station/Repeater with Power amplifier	100 Watt	80 Watt
2.b	Mobile	30 Watt	5-15 Watt
2.c	Hand held terminal	5 Watt	3 Watt
3	Adjacent channel spacing	12.5 KHz/25 KHz (Analogue)	12.5 KHz/25 KHz (Analogue)
		6.25 KHz/12.5 KHz (Digital)	6.25 KHz/12.5 KHz (Digital)
4	Duplex spacing	10 MHz	45 MHz



Chapter 9 Network Infrastructure for Data Communication

9.1 Scope

This Specification lays down the general, functional and technical requirements of Communication Infrastructure to be used as a sub-system of the ATMS implementation.

9.2 Function

This system provides connectivity between ATMS Control Centre and outdoor equipment such as Emergency Roadside Phones, Variable Message Signs, Mobile and fixed CCTV cameras, Speed Displays, VIDES, etc.

It also provides the external data connectivity required between the ATMS control centre and the NHAI ATMS Cloud as well as between the ATMS control centre and the NHAI ATMS Master & relevant Regional Control Centres.

9.3 System Configuration

1. The system shall comprise:
 - a) Cable System
 - b) Interface System
 - c) Optical Fibre Transmission System
 - d) Power Supply System

Note: As part of optimization of the communication system high-capacity point-to-point wireless links may be included to support the Optical Fibre cable-based communication system. However such a wireless link shall never form a segment of the main Optical Fibre backbone. The communication backbone shall be preferred to be realised via optical fibre. The wireless link can however be included as a direct link from a device like a CCTV Camera to an appropriate node (including the end nodes) of the Optical Fibre backbone. Such an approach may be utilised to connect road-side equipment to the ATMS control centre that may be otherwise difficult to do so via only the optical fibre link. Further, keeping in view of recent developments in 4G/5G, direct to cloud and wireless technologies, and especially but not limited to areas or projects where setting OFC is not feasible, ATMS provider may suggest use of alternative backbone. However NHAI may approve and accept such wireless links, proposed by the service provider, as part of the ATMS system network infrastructure only after the successful carrying out of proof-of-concept tests by the Service provider and confirmation from the Service Provider that no functional or service requirements will be violated purely because of this decision. The costs for such proof-of-concept tests shall be entirely born by the service provider.

2. **Cable System:** The system shall comprise:
 - a) Backbone OFC cables
 - b) Auxiliary OFC Cables linking access points to the back bone and road

- side equipment to access points
- c) Polythene insulated jelly filled outside plant Cat5e/Cat6 copper cable (PIJF OSP cable) linking various roadside copper based equipment to access points
- d) Coaxial cables.
- 3. **Interface System:** The system shall comprise:
 - a) Sensor interface equipment
 - b) Optical fibre cable interface equipment
 - c) Control Centre interface equipment
- 4. **OFC Transmission System:** The system shall comprise:
 - a) Optical line terminals
 - b) Interface Cards
 - c) Network management
- 5. **Power Supply System:** The system shall comprise:
 - a) 12/24V/48V DC power supply systems as per design requirements at various locations.
 - b) 230 V AC, 50Hz power feed as per requirements at various locations.
 - c) Solar PV –based power supplies for 230 V AC, 12/24 V DC as per requirements at various locations.
 - d) UPS, batteries and battery chargers, solar panels and chargers (if applicable) at Control Centre.

9.4 General Requirements

1. The cable system along with interface equipment shall work satisfactorily under adverse conditions like storm, etc.
2. The jointing and other accessories shall be suitably housed and be of compact and rugged design with suitable accessibility for ease of maintenance.
3. The individual sub-systems shall perform their assigned functions and in no way affect or influence adversely the performance of adjacent or associated sub-systems.
4. The backbone Fibre cable for safety and reliability shall be kept independent of other communication and power cables – such as
 - a) Other OFC Cables used for interconnecting the field equipment to the back bone / main control centre, copper cable etc.
 - b) Cables that carry power to the various ATMS field Devices.

9.5 Functional Requirements

1. **PIJF OSP CAT5e/CAT6 Cable System**
 - a) Road side equipment such as Emergency Roadside Phones, Speed display, VMS Displays or other equipment shall be connected through the PIJF Cable and terminated at an Ethernet switch in the nearest Access point
 - b) The PIJF Cable used shall electrically comply with Cat5e or Cat6 (preferred) standards.
 - c) Suitable punch-down lightning and surge protectors shall be used at prior to terminating cables at both ends.



2. Optical Fibre Cable

- a) The backbone of cable system shall interconnect ATMS Control Centre with access points situated at suitable distances from the ATMS Control Centre. Other access points shall link to the backbone via auxiliary OF cables from these locations.
- b) The OF Cable System shall carry signals from all outdoor equipment such as Emergency Roadside Phones, Variable Message Signs, ATCC Portable and fixed CCTV cameras, Speed Displays, through the network equipment at the access points to the Control Centre.
- c) The OF Cable system shall interconnect all the access points to the ATMS Control Centre and also if required with associated network devices for signal transmission without any impairment.
- d) The backbone communication OF Cable system shall not be broken anywhere in between to link access points or road side equipment. This cable shall be terminated only at the designated access points and the ATMS Control Centre. It shall not be allowed to interface any other sub-systems in the field to this cable or any spare cores in the cable directly or through branching.
- e) The separate and independent OF Cable system shall be used for the transmission of video signals, data signals from the equipment locations to access points where the copper cable has limitations for transmission of signals.
- f) The OF cable shall provide for dedicated spare fibres to cater to any future need that may arise.

3. Co-axial Cable System

- a) The Co-axial Cable System shall provide immediate interface to carry signals from analog CCTV Cameras (if used) to the encoders situated at the nearest access point.
- b) The OF Cable shall also be used with transmitters and receivers if the distance is large and high quality signal transmission and reception is not possible using co-axial system.
- c) The signals shall, without any impairment, be routed to the ATMS Control Centre via the equipment at the access point, auxiliary OFC and the backbone OF cable.

4. Interface System

- a) The Interface System shall cover the PIJF Cable, Co-axial Cable and OF Cable System & transmit and process the composite signals to achieve the desired reliability/availability requirements.
- b) The Interface sub-systems shall be capable of handling the composite audio, video and data signals at various interface levels and process them.
- c) The Interface sub-systems shall be designed optimally at various levels i.e. from the individual sub-systems level to integrator through to the Control Centre.

5. Power Supply System

1. The Power Supply System shall support the requirements of individual sub-systems.



2. The Power Supply System proposed for individual sub-systems shall take into account the overall availability/reliability requirements.
3. The Power Supply System design shall take into consideration local power availability, temperature and other climatic variations, and easy maintainability.

9.6 Technical Requirements

1. **PlJF OSP Cable**
 - a) The Cable shall be Cat6 manufactured by reputed manufacturers such as Lucent, Amp etc.
 - b) The PlJF Cables shall be laid in suitable trenches with protection against corrosion, inadvertent cutting, flooding, rodents and termites.
2. **OF Cable**
 - a) The Back bone OF Cable shall have a fibre count of minimum 12 fibres (24 cores). This cable shall not be used for any other connectivity.
 - b) The cable used for short-haul connectivity between outdoor equipment & Access points, access point to backbone etc. shall have fibre count as per the design requirements (8/12 cores). These shall be based on the location of equipment along the highway.
 - c) The fibre size, stranding, filling and associated technical and testing details shall also, as a minimum, comply with the TEC specifications approved by Department of Telecommunications, Govt. of India.
 - d) Methodology for cable laying, installation, splicing and protection measures shall be described in detail by the Service Provider for approval of NHA and shall conform to standard industry practices.
3. **Co-axial Cable System**
 - a) The Co-axial Cable System shall connect the cameras with the Control Centre via the access points. It shall have capability to interface with the OF Cable network for signal transmission.
 - b) The Co-axial Cable System shall conform to relevant ITU-T standards for signal transmission and protocols.
4. **Interface System:** The Interface System shall broadly operate at the levels as described below:
 - a) Way side (Emergency) phone to access point via PlJF Copper Cable.
 - b) VMS Signs to Access point via copper Cat 6 patch cord or OF Cable.
 - c) CCTV System to ATMS Control Centre via Co-axial to encoder (if required) and further via OF Cable.
 - d) Integration with the NMS equipment at different levels for monitoring, logging and control of individual sub-systems.
 - e) Interfaces at appropriate system and sub-system levels shall follow the protocols and standards of RS232, RS485, RS422 and ITU-T, IEEE, ITU-R or other approved international standards for transmission and networking of voice, video and data signals. These shall be as per the detailed specification in the tender elsewhere.
5. **Power Supply System**
 - a) The power supply arrangement at individual sub-system level shall be designed for their optimum and reliable operation.
 - b) The design shall take care of availability of local utility power and

necessary backup to achieve the desired performance objectives.

- c) Video Cameras and Variable Message Signs located on the roadside in particular shall be supplied backup power supply for operating in all types of weather conditions.
- d) Diesel Generators and UPS (Solar PV-based or otherwise) as required shall be included as part of the system design as per the need for sub-systems/ Control Centre. Design calculations to establish the capacity of these subsystems shall be furnished by the Service Provider.
- e) The power supply design shall take care of voltage and frequency fluctuations and redundancy to achieve the required system performance.
- f) Suitable lightning protection and earthing shall be provided to guard against system malfunction.

9.7 Cable Laying and Installation

1. The cable laying, installation, termination and wiring shall follow standard international practices. The Service Provider shall be solely responsible for the proper execution of the work.
2. Cable Laying
 - a) The Service Provider shall submit a cable route plan with distribution chart for the indoor and outdoor requirements.
 - b) Excavation of cable trench shall be done in all kinds of soil to a minimum depth of 1.65m from the ground below the central median/ edge of ROW depending upon the availability of land along of the highway and to a width of not less than 0.3m and also provide proper protection as required by NHAI while crossing power cables, pipe lines etc. The bottom of trench shall be levelled and got rid of any sharp material.
 - c) The cables shall be laid as far as possible on one side of the road. The Service Provider shall restore the road surface, diversion and other modifications as a result of the trenching to the original state after completion of this work. Wherever required depth is not achievable additional protection shall be provided in consultation with NHAI and with prior written approval of the NHAI and / or NHAI's representative.
 - d) The optical fibre cables shall be laid in permanently lubricated HDPE ducts of appropriate dimension with protection against moisture ingress, termites and rodents.
 - e) The OF cable and the PIJF cable shall be laid in the same trench. There shall be two or more ducts laid in the trench as per the requirement.
 - f) Whenever power cables are to be laid in the trench along with other cables, brick separation of at least 5 bricks/per metre length-wise shall be provided.
 - g) Right of way will be provided by NHAI.
 - h) The trenching and cable laying activities shall cause minimum disruption to the traffic flow on the highway. The material, cable drums and the manpower used shall not inhibit the flow of vehicles in any manner.
 - i) The excavation of trenches shall be done only in lengths that can be handled in a single day. The trenches shall not be left uncovered overnight.
 - j) The trenching and cable laying shall take into account likely diversions on bridges, toll plazas, built-up area, ERT (Emergency Road Side

- Telephone) pedestals, etc.
- k) The cable laid along the bridges shall be suitably protected (via GI conduits) and clamped.
 - l) Adequate extra length shall be left at the end of the cables to meet future exigencies.
 - m) Cable across the road from the backbone of OF/PIJF cable for ERT's and other sub-systems along the route shall be laid in ducts below the bed using trenchless ductsthrugh horizontal direction drilling. The procedure shall be deployed after written approval of the NHAI and / or NHAI's representative.
 - n) These shall be laid on one side of the highway. Crossings and cuts on the highway shall be provided with trenchless excavation. Suitable route markers every 500 metres shall be provided. Suitable no. of patch panels, joint boxes, termination boxes, pigtails and patch cords, etc. shall be provided.
 - o) Waste material such as unused ducts, cable cut-pieces, and other debris shall be cleaned and suitably disposed as per the relevant recycling and disposal standards by the Service provider.
 - p) The service provider shall provide adequate perforated cable trays and/or cable supports as per industry best practices.
 - q) All cables shall be numbered with ferules in accordance with the universal cable numbering system.
 - r) All cables shall be ISI marked, fire retardant low smoke type and shall be terminated with proper lugs and joints as per best industry practices.

Handhole and Manhole

The indicative sizes of the standard type of Handhole and Manhole shall be as follows:

Type	Number of Ducts	Length (m)	Width (m)	Depth (m)	Cable Bracket
Handhole					
HH-1	1-3	1.20	0.60	0.85	One side
Manhole					
MH-1	1-9	1.80	1.00	1.50	One side

9.8 External data connectivity to the NHAI ATMS Cloud and the NHAI ATMS Master, Regional or Traffic Police Control Centers

A suitable leased-line (wired or wireless) supporting a minimum 100 Mbps data link shall be provided by the service provider for the purpose of connection to the NHAI ATMS Cloud, NHAI ATMS Master & relevant Regional Control Centres and Local Traffic Police Control Centre. Such a link shall make the ATMS system directly on-line accessible to the above NHAI facilities and shall provide the following information:

- 1) Video images & required data strings to the NHAI ATMS Cloud at pre-programmed intervals and on demand.
- 2) Providing streaming video data, streaming audio data and data strings on demand from the NHAI Master & relevant Regional & Traffic Police Control Centres.

Further this link shall also fully support the on-line access of the ATMS system by NHAI / NHAI's representative as described in Clause 2.2.8.3 of this document.

Chapter 10

ATMS Control Centre with ATMS Software

10.1 Scope

This Specification lays down the general, functional and technical requirement of the ATMS Control Centre.

The Control Centre shall accommodate following equipment and software:

- (i) Central Computer Server (with integrated ATMS Software including the trafficManagement and Rescue module, integrated audio communication unit & support for relevant Mobile smartphone applications)
- (ii) Emergency call management system equipment and software
- (iii) Integrated Traffic Management (ITM) console consisting of mainly the ITM workstation(s), the Integrated audio communication unit and farther integrated with the
 - 1. Large Display Board based on the Video-wall 3 x 2 meters
 - 2. CCTV Console,
 - 3. VIDES console and Dedicated Video-wall (Minimum 75" Smart TV)
 - 4. other equipment
- (iv) ATMS software
- (v) Mobile radio operator and configuration equipment and software
- (vi) Backbone communication equipment and Network Management System for the same
- (vii) Printer
- (viii) Uninterrupted Redundant Power Supply with supply system and back up Firewall, IDS, IPS and other network security component and critical systems such as servers, storage etc.
- (ix) TMC Central Processing Servers in hot standby configuration (Primary + Secondary)
- (x) Backup Video Recording (Only Incidents) Server with adequate inbuilt storage and hot standby.
- (xi) Mains Power supply system and Diesel Generator set equipment.

The ATMS Contractor shall also undertake any additional civil works, interior works, MEP works, for setting up the Command Center, including all additional related electrical, lighting, electrical connection, DG set, power backup, HVAC works, access control, building CCTV, PTZ cameras outside building, firefighting system, alarm, fire extinguishers, raised floor, housekeeping, building cleaning, maintenance, recurring charges including electricity bills, telephone bills, DG fuel, servicing, security.

10.2 Function & Architecture

ATMS Control Centre would be the facility from where all the activities of the ATMS would be controlled. ATMS Control Centre would primarily comprise of the in-door portion of CCTV, VMS, and other support systems. All the aforementioned sub-systems shall preferably reside in a dedicated permanent structure with adequate floor area to house the required man power and equipment. Where ever such a permanent floor/building/structure cannot be made available, the ATMS Control Centre shall be housed in temporary portable cabins.

A schematic of the ATMS control centre system is shown in figure 1 below:

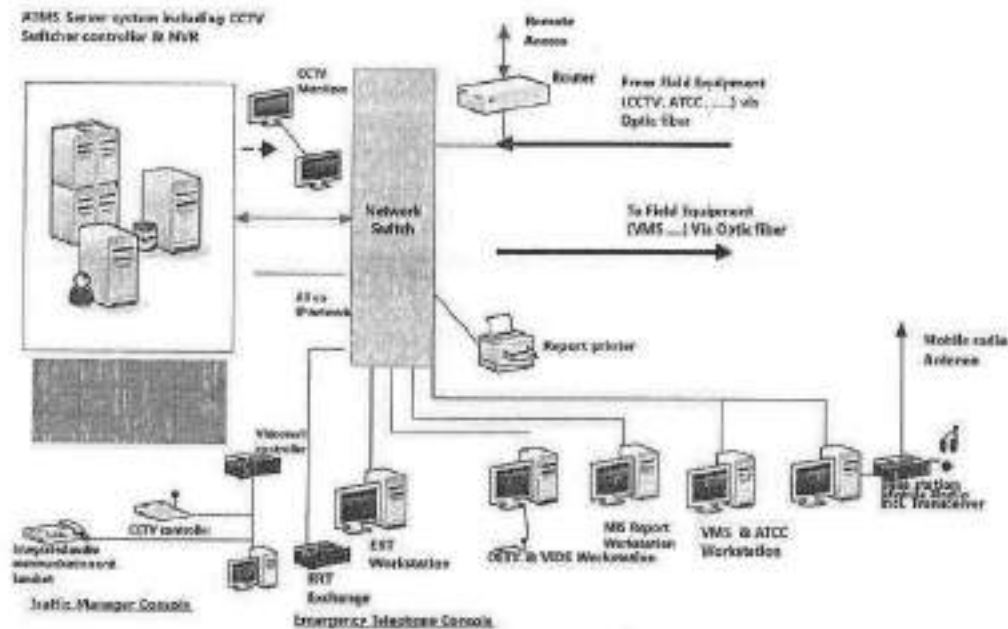


Fig 1 ATMS Control Centre system

Note:

- a) Even though specific workstations have been allotted to each specific functionality, each of the applications (e.g. VMS, ATCC, CCTV, VIDS etc) shall execute on any of the above workstations if required.
- b) An additional workstation shall be used to present/depict all the speed displays. Additionally some of the CCTV Monitors may also be used.

10.3 Functional Requirements

Since the ATMS Control Centre houses the in-door functional components of all the installed ATMS sub-systems (CCTV, VIDES, ATCC, VMS etc.), the following subsections describe the functional requirements including a brief specification for the temporary portable cabin.

10.3.1 General

1. Each sub-system shall be designed (storage capacities etc) with at least 10 years of traffic increase in the highway from the time of setup.
2. Each sub-system shall be expandable to account for increase or decrease in field installed devices. Minimum $\pm 25\%$ spare capacity (rounded off to the nearest higher whole number) should be ensured.
3. All the supplied equipment shall operate on 230 V, 50 Hz single -phase power supply. Power for all the equipment will be regulated using on-line UPS with minimum 30 minutes or more back up. If any equipment operates on any voltage other than the supply voltage and supply frequency, necessary conversion/correction device(s) for such requirement shall be supplied along with the equipment.
4. All the control equipment e.g. fileservers, database servers, NVR/CCTV CAMERA SERVER, Video Analytics NAS/Raid backup device, decoders, networking equipment etc. shall be provided in standard Racks.
5. System shall have provision of WAN/5G connectivity for remote monitoring.
6. Online backup should be maintained to protect against storage failure.
7. The system provider shall provide all technical details regarding data formats, communication protocols, packet formats, etc. to NHAI.

8. All sub-system software modules shall be available in all the workstations, so that, with minimum intervention of System Maintenance, one user-group can perform their operations on a different workstation. However, for security reasons, only the functionality based on the expected user-group who is utilizing the workstation for day-to-day operation shall be available for immediate use.
9. All Sub-systems shall generate and report alerts when a pre-defined event occurs.
 - (a) **Safety related alerts / reports:** Further all the software modules of the sub-systems installed (CCTV, VMS, Speed display, Roadside Communication etc.) shall deliver safety-centric reports (e.g. fatal collisions in a given stretch, violation of regulation etc.), enforcement-centric (number of tickets issued, comparison of violations on monthly basis etc.);
 - (b) **Equipment related alerts / reports:** Failed packets, number of repairs carried out on field devices, down time on account of major faults etc.
 - (c) All sub-system (e.g. CCTV, VMS, VIDES, VASD etc) related alerts & events shall also be communicated to the Traffic Management console for display on the Video wall / Traffic management console workstation.
 - (d) Further each sub-system shall also accept commands / messages from the Traffic Management console for ensuring the achievement of an Integrated ATMS system.
10. The system shall provide detailed reports related to the System Operations (including the actions of various stakeholders during Incident Management) and operations. The format for the same shall be finalized by the service provider in consultation with NHAI and / or the NHAI's authorized representative. Maintenance reports, at the minimum, shall include the current operational status of each equipment, actual events of down-times of each equipment, actual events of Mean time to Repair of each equipment and actual events of Meantime between failure of each equipment and the preventive & repair maintenance log.
11. The system shall also provide a method to log and report road highway incidents. Data used for logging and reporting shall be 'picked-up' automatically from the road-side / field equipment and other sensors as applicable.
12. Further the system shall provide a facility of generating user-formatted reports that can, for example, bring together the occurrence of highway incidents, values of various sensors and the operational status of various equipment on a common time line / scale.

13. System Security

- a) It shall be possible to control / restrict all functions / sub-functions (can be menus, submenus, buttons to perform specific operation), etc. available in each module based on the user group in general and in certain special user groups viz., Project Manager / Administrator, the control shall be possible at the user level.
- b) The Access control shall have 3 levels of access, Read, Write, and Modify. It shall be possible that any user / user group can be assigned none / all from the above levels for a specific function.
- c) All the manual override options shall be considered separate functions and it shall be possible to disable these functionalities by simply not allowing access to these functions for any user / user group.
- d) Detailed list of Access rights shall be evolved during detailed engineering.
- e) At the end of session, the operator logs out from the application and the logout shall be recorded in the database.
- f) It shall not be possible for a different user to open a separate instance of the

application without the current user logout in the same workstation.

- g) It shall be possible to exit the application only with Administrator authentication including username and password.

10.3.2 CCTV & VIDES

1. There shall be a Supervisory Monitoring & Control System with Digital Video Surveillance Control Software to manage all the video surveillance devices.
2. The Supervisory Monitoring and Control System shall consist of at least a Camera Switcher controller, Joystick, Camera server, NVR, & adequate number of workstation (CCTV & VIDES workstation). The system shall be able to provide streaming video images to the video Wall and / or the above monitors and / or workstation.
3. The supervisory monitoring and control software should be capable enough to display and manage the entire surveillance system. It shall support a variety of devices such as cameras (PTZ, Fixed & VIDES), video encoders, video decoders, PTZ controller, NVR, NAS boxes/Raid backup device etc.
4. The manufacturer of the CCTV Switcher Controller /NVR /Camera Server shall be
 - a) A well-known and established company worldwide in the field of Information Technology.
 - b) Has established and appointed representative or authorized agency near project location.
 - c) Capable of providing adequate after-sales service and support on 24X7 basis.
5. The software shall operate on open architecture and integrate/ co-exist with other subsystem software that are installed to manage VMS, WIM, Speed Display, and Roadside Communication etc.
6. The software shall store configuration of encoders / decoders and cameras. There shall be options to generate reports of stored device configuration.
7. The control software should provide for alarms and alarm log. Alarm settings need to be individually configurable for each alarm and each camera prerecord duration. The duration shall be selectable from a list of values ranging between 2 seconds or less to 5 minutes or more. There shall be provision to achieve, print and display the log using device filter, device group filter and/or a time window.
8. The administrator should be able to create, add, edit & delete users. He should be able to administer access rights to system resources and functionality as well as access permissions to a list of camera a user can view and control.
9. The administrator should be able to place users in a hierarchy. The higher priority user should inherit the rights of a lower priority user automatically when he is taking overriding control of cameras, which are already being controlled by a lower priority user. There should be minimum 3 hierarchical levels of security for providing user level log in.
10. The system shall provide User activity log (audit trail) with user id, time stamp, and action performed, etc.
11. For monitoring purposes, Video walls (For TMCS and VIDES) shall be setup with suitable mounting arrangements, as described in section 13.3.2.1. Facility for viewing and controlling all the cameras at various other locations e.g on CCTV monitors (supporting HDMI, RGB & IP-based), as required, shall be provided in addition.
12. The Area under surveillance shall be monitored and controlled from ATMS Control Centre through workstations and Joystick controllers with the help of Digital Video Surveillance Workstation Frontend Software as part of the Supervisory monitoring and control system Software.
13. The Workstation Frontend Software should also be working on a browser based system

- for remote users to allow any authorized user to display the video of any desired camera on the monitor with full PTZ and associated controls. This provision may also be used to provide access to NHAI HQ, PD/RO and local Traffic Police representative.
14. The software should Support flexible 1/2/4 Windows Split screen display mode or scroll mode on the PC monitor or on preview monitor as per requirement.
 15. The software should be able to control all cameras i.e. PTZ control, Iris control, auto- / manual focus, and colour balance of camera, Selection of pre-sets, Video tour selection etc.
 16. The user shall have the facility to request for view or control of any camera outside his rights for a reservation period. Control of camera is released after the reservation period (Request enhanced control rights for a short duration).
 17. ATMS Control Centre may have one or more Operators simultaneously controlling the installed field video hardware.
 18. The recording resolution and frame rate for each camera shall be user programmable.
 19. Recording modes such as continuous, manual, or programmed date-time- duration modes, camera, group of camera-wise. All modes may individually be disabled or enabled using scheduled configuration. It should also be possible to search and replay the recorded images on date, time basis as well as camera basis. It should provide onscreen controls for remote operation of PTZ cameras. It should have the facility for scheduled recording. Different recording speeds (fps) and resolution for each recording mode for each camera should be possible.
 20. The NVR / CAMERA SERVER can be an embedded-type or server-based or cloud based if meeting all functional requirements. However, the NVR /CAMERA SERVER software shall run on off-the-shelf available servers (Camera server & Database server). Each NVR / Camera Server shall be able to handle 36 or more cameras.
 21. Network Video Recorder shall offer both video stream management and video stream storage management. Recording frame rate & resolution in respect of individual channel shall be programmable.
 22. System should ensure that once recorded the video cannot be altered: Ensuring that audit trail is intact for evidential purposes.
 23. System shall store all camera recordings (TMCS/VIDES/Command Centre CCTV etc) for a period of 180 days or until SLAs have been assessed for that period, whichever is larger. Storage should be sufficient such that video can be stored @ 25 FPS, at 2 MP or better quality using necessary compression techniques for all cameras (extended capacity of cameras i.e. present capacity + 25%).
 24. System must provide built-in facility of watermarking or Digital certificate to ensure tamperproof recording so that these can be used as evidence at a later date, if so desired. The recording shall support audit trail feature.
 25. All camera recordings shall have Camera ID & location/area of recording as well as date/time stamp. Camera ID, Location/Area of recording & date/time shall be programmable by the system administrator with User ID & Password.
 26. Facility of camera recording in real-time mode (25 FPS)/15/12.5/10 or lower FPS as well as in any desired combination must be available in the system.
 27. Facility of Camera recording in 720p/1080 or in any combination i.e. any camera can be recorded in any quality – Selective or Group of cameras must be available in the system.
 28. Video shall be compressed using MPEG-4 or better standard and streamed over the IP network. Once on the network, video can be viewed on a Control room workstation or over the Internet remotely or on analog monitor using a hardware decoder (MPEG-4/compatible standard Receiver) and shall be recorded on NVR/CAMERA SERVER and shall be backed up on NAS/RAID Backup device.

29. System shall be triplex i.e. it should provide facility of Viewing, Recording & Replay simultaneously.
30. The offered system shall have facility to retrieve/export/ backup (on Pen Drive, External HDD, CD, DVD etc.) the desired portion of clipping (from a desired date/time to another desired date/time) through the search functionality of the application software. Viewing of this recording shall be possible on standard PC using standard software like windows media player etc. Log of any such activity should be maintained by the system for audit purposes.
31. Redundancy/Fail-over feature is required i.e. in case of failure of an NVR/CAMERA SERVER the relevant cameras shall automatically switch over to the redundant NVR/CAMERA SERVER.
32. Database Server shall keep track of all configurations, error data, configuration events, usage events and error events.
33. Video stream from individual cameras shall be recorded on respective NVR/Camera Server & subsequently, archived to NAS box/RAID backup device.
34. The Necessary script/algorithm for the above must be available in the Application.
35. All the workstations in LAN should be provided with software to view and control the cameras, encoders and retrieve the recorded video images from the NVR/CAMERA SERVER/NAS/Raid backup device seamlessly.
36. A similar such dedicated workstation shall be provided for the usage of representative of Traffic Police or other Enforcement Agency as required.
37. VIDES
- a) It shall be possible to switch and view video streaming images on-line from all VIDES Overview cameras on the CCTV monitors and VIDES Videowall and the CCTV, VIDES workstation
 - b) The supervisory software (executing on the VIDES Supervisory computer) shall determine the following parameters related to traffic flow monitoring
 - (i) Traffic volume (No of vehicles detected during the time interval);
 - (ii) Occupancy (Lane occupancy measure in percentage of time);
 - (iii) Vehicle classification, Flow rate (vehicle per hour per lane);
 - (iv) Headway (Average time interval between two vehicles);
 - (v) Speed, Level of Service;
 - (vi) Space occupancy &
 - (vii) Traffic Density from both the ATCC and the VIDES data captured from the respective field equipment.
 - (viii) All incidents and analysis as defined in Chapter 4.
 - c) The allowed errors on count and detection will be as mentioned in Chapter 4.
38. Violation Verification Module and Vaahan Database Integration:
- a) VIDES software shall be integrated with Vaahan Database for creation of eChallans for all cases where violations have been detected automatically or manually.
 - b) Primary source for violations will be the VIDES (Overview + ANPR) cameras which will be integrated with this module.
 - c) The module shall allow for registering of violations as detected manually through RPVs or through TMCS Cameras. Such events as received from ground staff/enforcement agency shall be verified by control room manager and upon authentication from the manager, the operator shall create the event in the application.
 - d) Each event/violation should have necessary evidence and data as required by Vaahan database for eChallan generation.
 - e) The module will allow operator to verify the number plate as captured by the ANPR and in case the number is wrongly read, there will be an option to edit the same. Each edit shall be saved in the database for 100% audit by manager.



10.3.2.1 Video Wall (large display board)

1. The video wall shall typically be a matrix of 3x3 but the controller shall be capable and flexible enough to accommodate varied different monitor matrix geometries as dictated by space availability or constraints.
2. The typical video wall display size shall be 3x2m.
3. Video wall controller shall be capable of capturing and displaying video information from different sources such as DVI, DisplayPort, VGA, IP streaming etc.
4. The monitors used in constructing wall display matrix shall have bezel edge sizes less than 6 mm.
5. The video wall shall be an integrated package of control room display management and configuration software, display controller capable of handling at least 48 monitors, and the required number of slim bezel monitors.
6. The video wall system shall support hot-plugging and redundancy.
7. Video wall controller shall support auto calibration and auto colour balancing.
8. Mounting arrangements for individual monitors within the wall matrix shall be designed to allow for easy replacement and hot plugging.
9. The manufacturer of the Video wall shall be
 - a) A well-known and established company worldwide
 - b) Have an established and appointed representative or authorized agency in project location.
 - c) Capable of providing after-sales service and support on 24x7 basis adequately.
10. The target image on the Video wall shall be freely resizable and re-positionable on any part of the Screen.
11. The Video Wall shall be capable of accommodating multiple displays in multiple rows and columns behaving as single logical screen.
12. Separate Video Wall shall be provided for VIDES with minimum 75" smart TV

10.3.3 VMS

1. There shall be a Control System with Variable Message Sign Control Software to manage all the VMS Boards within the installation.
2. The software should be capable of managing at least the number VMS's designed for the package. It should support VMS boards of varying sizes.
3. The software shall operate on open architecture and integrate/ co-exist with other subsystem software that are installed to manage CCTV, VIDES, WIM, Speed Display, and Roadside Communication, apart from the Traffic Management module (where applicable) etc.
4. The software shall store configuration (VMS ID, its actual location, brightness levels, horizontal pixel size, number of lines supported, Regional Language supported etc.) of each VMS that it controls. There shall be options to generate reports of stored device configuration.
5. The VMS boards associated with the VIDES should be integrated with the VIDES such that incidents identified by VIDES that need to be warned to incoming traffics are automatically relayed without any manual intervention. Details of which incidents require automated warning messaging are in the relevant section in VIDES.
6. The system should support adaptive display brightness to adjust readability to the changing outdoor environment.

7. The control software should support some form of CRC¹ on display data and control command packets for device error reporting.
8. The administrator should be able to create, add, edit & delete users. He should be able to administer access rights to system resources and functionality as well as access permissions to a list of VMS a user can control.
9. The administrator should be able to place users in a hierarchy. The higher priority user should inherit the rights of a lower priority user automatically when he is taking overriding control of VMSs, which are already being controlled by a lower priority user. There should be minimum 3 hierarchical levels of security for providing user level log in.
10. The system shall provide User activity log (audit trail) with user id, time stamp, and action performed, etc.
11. ATMS Control Centre will have a workstation for VMS operation. Facility for controlling all the VMSs at various other locations, as required, shall be provided.
12. The VMS to be controlled shall be accessed from ATMS Control Centre through workstations with the help of VMS Control Workstation Frontend Software. Further the above software shall also accept messages for display from the Traffic Management console programmed on GUI interfaces provided by this software.
13. As the VMSs can be configured to display messages in a chosen regional language, the software should be able to control VMS configured for any regional language.
14. The user shall have the facility to request control of any VMS outside his rights for a reservation period. Control of VMS is released after the reservation period (Request enhanced control rights for a short duration).
15. ATMS Control Centre may have one or more Operators simultaneously controlling the installed VMSs.
16. As stated earlier, all data and command packets shall have a suitable CRC attached to them. All packets sent would be acknowledged by a response packet from the respective display with its own CRC.
17. The response packets from VMSs shall include status (command executed or not) as well as error codes to indicate the nature of error.
18. The system should support multicast (broadcast to a predefined group of displays) and broadcast. Multicast or broadcast packets shall have no response packets from VMSs.
19. A single message may be shown as a static sign or a group of messages may be shown in a round robin fashion till a new set of messages are not relayed to a particular VMS.
20. The time duration for which a message is displayed while in round robin mode will be programmable from 1 second to 255 seconds.

¹ Cyclic Redundancy Check

21. VMS and the associated software shall support the following text animations:
- Scroll right to left
 - Flashing (For example, this would be to attract attention to speed limits)
 - Typing
 - Curtain top to bottom
 - Curtain bottom to top
 - Replace left to right
 - Replace right to left
 - Text without any effect (for example, this would be default for most text)
22. The use of text effects shall be strictly a policy of NHAI road safety experts dictated by situation and hence, should not be a fixed global parameter. It shall be dynamically assignable and remain valid for a text string for the current instance alone.
23. It shall be possible to send ten strings in round robin mode.
24. Database Server shall keep track of all configurations, error data, configuration events, usage events and error events.

10.3.4 ATMS software

- The ATMS software integrates the field equipment like CCTV cameras, VIDES, & VMS with the Integrated Traffic Management (ITM) console to ensure the availability of an effective system for Traffic monitoring & Incident / accident management
- The ATMS software shall be based on a modern architecture and shall optimally execute on the ITM workstation and the ATMS server to ensure that
 - The system response are instantaneous to support effective Traffic Management (i.e. Traffic monitoring and Incident / accident management) actions on the ITM workstation.
 - No information (data, video stream & audio stream) from any source is lost. Further all such information is made available on the Integrated Traffic Terminal, with no delay, precisely at the time they are required.
 - Effective integration with the CCTV system, VIDES system, VMS system and other relevant ATMS equipment is carried out in a seamless manner with no disruption of / disturbance to the Traffic management function (i.e. Traffic monitoring and Incident / accident management). For such integration, standard interfaces (e.g. NTCIP) shall be used wherever available.
 - All information (Data, video and audio streams) collected from various sources shall be archived in the ATMS server for quick retrieval by authorized personnel. However the performance of the ATMS software in terms of response times shall not be affected during such a retrieval process.
- The ATMS software shall be a modular system comprising of at least the following modules:
 - Data acquisition module for acquiring data, video streams and audio streams from field equipment
 - Highway Traffic Monitoring module
 - Incident / Accident Management Module



- D. Integrated audio communication module
- E. Report generation module and Dashboard
- F. System Administration module
- G. Communication module for authorized access by external systems (e.g. NHA's Regional control centre & the Main control centre)
- H. API Integrations with Vaahan, NPCI FASTag Mapper, NHA's ERP (Data lake at the time of this notice), 1033 CAD, Rajmarg etc.
- I. Network Management Software

A. Data Acquisition module

- i. The Data Acquisition enables the acquiring of data from the various field equipment in the form of data strings, video streams and audio streams. Examples include
 - Data strings from VID system, ATCC system, WIM system, VAS system
 - Data strings of Date and Time and details of events (e.g. the time an Emergency Call was attended to on the 1033 telephone line or on the ERT phone system), alarms and faults related to any part of the system.
 - Video Streams from CCTV Camera, VID Camera
 - Audio Streams related to conversations on the 1033 Emergency Telephone, Road-side Emergency Telephone
- ii. The module allows the user to configure the acquisition conditions as follows:
 - At regular intervals of time with the interval being user specified (e.g. from the ATCC system)
 - On the occurrence of Traffic related events in the field (e.g. data from the VID system, instances of calls from Emergency Telephones)
 - On demand (e.g. Video stream from a CCTV Camera)
 - On the occurrence of system related events like equipment failure and restoration, user login / logout
- iii. The above information thus acquired shall be stored in the ATMS server using an established database package like Oracle or MS SQL.

B. Highway Traffic Management module & GIS Dashboard

- i. This module shall support effective Traffic monitoring on the highway. The targeted road section or the entire stretch shall be depicted on the Large display (video wall) and ITM workstation, in the form of animated screens including Graphic User interfaces not limited to specified under Clause 816.1 to 816.17 of Specifications for Road and Bridge Works of MoRT&H.
- ii. An interactive GIS map (free and open source such as OpenStreetMaps etc or proprietary) shall be available for all workstations and on the video wall. The GIS map should include:
 - iii. Icons for which CCTV, VIDES, VMS and other devices.
 - iv. On clicking the device it should open up the video feed of the cameras or show the message being displayed on the VMS and allowing for modifying the message from there if user has permission.
 - v. It should be possible to update the message on the VMS from here.

- vi. Any incident triggered from VIDES of TMCS shall appropriately modify the icon of the camera on this GIS map to call attention of operators.
- vii. When the video stream for VIDES or TMCS is clicked and pulled up, it should be possible to "create an event" for the dispatch. This would automatically capture the photo from the stream, location and allow to choose type of incident detected if manual. This event in one-click should be possible to be dispatched to nearby emergency vehicle if ICAD has been setup.
- viii. The map should show at all times the live location of the Crane, Ambulance and RPVs through data received from AIS140 or ICAD solution.
- ix. Section of the highway stretch should highlight to show traffic flow as identified by VIDES (different colours for different flows, separated by direction).
- x. If any device is not functioning, the same shall also be easily seen from this GIS map if the icon of the device is appropriately changed during malfunction.
- xi. The GIS map shall show if any event has been passed to ATMS through 1033, ICAD or Rajmarg Yatra based on the location of the incident.
- xii. It should be possible to click on an incident either from VIDES, TMCS, ICAD, 1033 or Rajmarg or Manually on Any location of the Map and create an event for emergency response dispatch.
- xiii. The GIS map shall have an equivalent strip chart interface.
- xiv. The map shall allowing zooming into relevant sections with no loss to definition.
- xv. The details of the project-specific composition of the GUI will be finalized during the project execution phase between the Service Provider and NHAI (or its authorized representative).

C. Incident / Accident Management module

This module shall support Incident / Accident Management by:

- i. Allowing the Traffic Management console operator to locate and mark (with a mouse) an accident / incident on the GIS map of the highway and initiate the Incident management actions.
Displaying a contextual on-line checklist for the operator to follow in sequence. Further the clicking on each item of the checklist shall automatically activate the related ATMS equipment to aid in the management viz.
 - a. Seamless audio connection for the Traffic Management console operator, via the integrated audio communication unit, irrespective of the communication media (Mobile radio, Mobile phone/landline, road-side Emergency telephone), to the ambulance, Trauma Care Centres, Patrol & other O&M vehicles.
 - b. Automatic Pan, Tilt and Zoom of the nearby camera to view the accident
 - c. Bringing on the VMS -wise message edit screen (by interfacing with the VMS Control software to create and dispatch messages to VMS

boards and mobile apps of registered road users). The checklist itself shall be derived from the relevant Traffic Management and rescue procedures captured either in the Operation (O&M) manual of the highway or based on world-class best practices.

- ii. Logging the time-stamp of the operator operating each element of the checklist to aid in 'post-facto' analysis of the operator's performance towards establishing his/her efficiency and further training needs and SLA monitoring needs.
- iii. Automatically performing pre-defined actions related to each of the above elements (e.g. Identification of the accident spot on the road shall control the nearby CCTV cameras to 'look' in the direction of the accident spot)
- iv. Aiding on-line tracking (via GPS) of the various O&M vehicles like the Ambulance, Tow-vehicle and the Patrol vehicle supported with dynamic display of information like shortest route, travel time to the accident spot, Trauma Care Centre etc.
- v. Providing a user-programmable facility, as an aid, for the automatic generation of VMS messages depending on incidents based on e.g. information measured by the MET sensors and sensors installed on the highway (e.g. the generation of a Visibility Alert signal in the event of visibility going below 1 km). This module shall alert the operator on generating the message which shall then be deployed on the operator's approval.
- vi. The detailed workflow of this module involving various checklists, shall be finalized between the service provider and NHAI during the project execution phase.
- vii. The module should be able to have complete functionalities as given under Chapter -4 including incidence response and facilitating generation of e-challan through NIC.

D. Integrated audio communication module

This module shall interface with and control the integrated audio communication unit to aid the operator seamlessly communicate with various stakeholders via a host of communication media like telephone landlines, mobile telephony, mobile wireless etc.

E. Report generation module & Dashboards

- i. This module shall generate periodic as well as on-demand statistical reports using data received from VIDES, TMCS, Automatic Traffic counter cum Classifier for traffic planning and management, as well as traffic forecasting. There shall also be a provision to generate reports to aid planning and strategizing enforcement.
- ii. While tabular reports are necessary, the ATMS software shall include visually appealing and useful dashboards and charts for efficient day to day management, monitoring and operations.
- iii. Further, the Database/Data Analyst in the ATMS shall on their initiative and on request conduct statistical analysis on the data being generated and provide insights to the manager and NHAI PD on a monthly basis.
- iv. The reporting module shall provide a range of reports on demand including those



- o related to the acquired data,
 - o VMS messages edited and sent,
 - o System generated Equipment availability and downtime.
 - o System malfunction and restoration
 - o User login – logout
 - o Daily Accidents that happened on the highway and their action taken report.
 - o Manually detected and Automatic VIDES events detected by location, vehicle type, and action taken, end to end response time etc.
 - o eChallans generated (manual vs automatic) and sent to Vaahan.
 - o Mobile App messages received
 - o Traffic flow volume (No of vehicles detected during the time interval), Occupancy (Lane occupancy measure in percentage of time), Vehicle classification, Flow rate (vehicle per hour per lane), Headway (Average time interval between two vehicles), Speed, Level of Service, Space occupancy & Traffic Density from both the ATCC and the VIDES data captured from the respective field equipment.
- v. The ATMS Software shall have provision to select end of day reports through API automatically to NHAI's Data Lake or equivalent.
- vi. The module shall further provide detailed performance reports on all aspects ranging from detection of incidents, through the field Operations team (Patrol vehicles, Break-down cranes and Ambulances) actions, Traffic Management Console operator and other ATMS Control Centre operator actions. Automatic system generated reports supporting the service provider's claim of meeting the service level requirements with respect to operations, shall also be provided.
- vii. The Report Generation Module will ensure that all the metrics mentioned in the SLA in Annexure are easily available and automatically generated. In case manually verification of random footage is required in SLA calculation, the reporting module will provide easy module to fetch footage in any time period/equipment as needed.

While, Detailed formats of each report shall be finalised by the Service Provider in consultation with NHAI – formats for select key standardized reports has been added in the Annexure.

F. System Administration module

This module shall essentially enable the definition and maintenance of user accounts.

G. Communication module

This module will manage authorized access to the ATMS system by

1. Authorized NHAI personnel / representatives
2. Other authorized NHAI systems like the Regional office Control Centre ATMS system and the Main Control centre ATMS system
3. Any other system authorized by NHAI

Based on requests from the above entities the communication module shall provide the following information to the requesting entity:

- i. Video Streams (Live and Archived)
- ii. Audio streams (Live and Archived)
- iii. Data strings and Data elements (Live and Archived)

The standard data exchange protocols for the above will be shared by NHAI with the Service Provider.

H. Integration with Vaahn Database, NPCI FASTag Mapper, Police Control Rooms, Dial 112, DataLake, 1033 ICAD, Rajmarg etc.

ATMS software shall be required to be integrated with IT systems from NHAI or other Government Agencies from time to time basis. This shall be possible at no additional cost whether during installation or O&M phase of the contract.

I. Equipment/Network Management System

The Solution should provide fault & performance management of the infrastructure and should monitor IP/SNMP etc enabled devices like Cameras, Routers, Switches, ATMS Software, Emergency Call Boxes, Sensors, etc. (i.e., all devices supplied as part of scope). This system shall also help monitor key KPI metrics like availability, in order to measure SLAs. It shall include key functionalities that are required to assist administrators to monitor network faults, uptime & performance degradations in order to reduce downtimes, increase availability and take proactive actions to remediate & restore equipment services. The Contractor will provide a real-time dashboard for monitoring equipments/network for which NHAI will have access to check and monitor SLAs at any time. The Network Management System should ensure that the items mentioned in the SLA in Annexure are automatically calculated and reported in the requisite format thereby making it easy to monitor the SLAs at glance.

10.3.5 Integrated Audio Communication Unit

The Integrated Audio communication unit enables the Traffic Manager / operator to communicate with all stakeholders in a seamless manner irrespective of the medium of communications. Using a hardware like a digital telephone exchange that supports software control, this unit allows the Traffic manager wearing a headset with a microphone (or a handset) to seamlessly communicate with the stakeholders in traffic operations using various audio communication media like Mobile wireless radios, Mobile (GSM) telephones, Telephone landlines as well as the road-side Emergency Telephone. The communication is initiated on selection of a context sensitive checklist element or by selection of suitable icons on the ITM workstation screen during the Traffic monitoring or accident / incident management. This unit shall support communication between the Traffic manager and a single stake holder or a group of stakeholders. As a back-up option this unit shall also enable such communication via physical push-buttons located on the unit. All calls will be logged and recordings kept for a period of 180 days or until SLAs have been assessed for that period, whichever is larger.

Note: All calls to the command centre and from the command centre to stakeholders will be recorded in the system and logged automatically through the Integrated Audio Communication Unit. These call logs will play an important role in monitoring of SLAs.

10.3.6 Interface with Mobile Phone Apps

1. **Rajmarg Yatra App for Road Users:** The ATMS control centre system shall seamlessly interface with NHAI's Rajmarg Yatra through standardized API interfaces or through module on Rajmarg prepared for ATMS. The integration should be regarding the following but not limited:
 - a) Getting live information from incidents reported by highway users on the particular stretch. The ATMS system should be able to generate an incident event in similar fashion and alert operator about location of incidents as reported by User through Rajmarg App. The API shall the location, photo and incident type etc. The nearest TMCS camera should be identified automatically based on the incident location for the operator to confirm the incident and dispatch necessary support.
 - b) ATMS software and its sub-systems (VMS, VIDES and TMCS) should be able to send information regarding traffic, congestion, maintenance work, identified incidents, accidents and manual messages to Rajmarg Yatra users through either API or through module prepared for ATMS Manager on Rajmarg webportal. These messages will be geo-tagged and broadcasted by Rajmarg to users in the vicinity of the incidents. For events like construction etc, the ATMS software shall also inform to Rajmarg when the event has closed.
2. **App for Enforcement Agencies/Highway Traffic/Route Patrol Agencies:** In the event a centralized integrated computer aided dispatch (ICAD) system is utilized by NHAI, the ATMS Software shall be integrated with it:
 - a. Any incidents as identified by 1033 shall be communicated to the ATMS Command Centre by creating logins for Operators on the ICAD or through API integration with the ATMS GIS Map or relevant modules such as VIDES etc.
 - b. Incidents as identified by command centre through VIDES or Manually that required emergency vehicles (RPV, Ambulance, Crane etc) being dispatched should be communicated to response teams through the centralized ICAD. A module will be created on ICAD or ATMS software which would allow sending tickets/events to dispatch vehicles and thereon tracking by operators and closure of events by emergency vehicle app users.

10.3.7 Emergency Telephone console

1. There shall be a Control System with a Control Software to receive all Emergency Communication from the NHAI 24 X 7 National Highways helpline and the Emergency Road-side telephones (shortcode '1033').
2. The software shall operate on open architecture and integrate/ co-exist with other subsystem software that are installed to manage CCTV, VMS, WIM, and Speed Display, apart from the Traffic Management module (where applicable) etc.
3. The software shall store configuration Emergency Roadside Telephone ID, Location on the highway stretch etc.) of each Emergency Roadside Telephone it controls. There shall be options to generate reports of stored device configuration.
4. The system shall record all calls on to a dedicated server with adequate

indexing to retrieve the same on a later date.

5. The help desk will be manned by call managers / operators. The administrator should be able to create, add, edit & delete users (call managers/ operators). He should be able to administer access rights of the entire highway or a section thereof to the call manager.
6. The administrator should be able to place call managers in a hierarchy. The higher priority manager should inherit the rights of a lower priority manager automatically when he is taking overriding control of Emergency Roadside Phones, which are already being controlled by a lower priority manager. There should be minimum 3 hierarchical levels of security for providing user level log in.
7. The system shall provide activity log (audit trail) with user id, time stamp, and action performed, etc.
8. The system shall perform communication health check (link quality check) on all the connected field communication devices and report errors if any on the administrator console.
9. ATMS Control Centre shall have dedicated workstations for Call management. For monitoring purposes, Video monitors shall be setup and would show the location of originating and on-hold calls clearly on relevant map sections of the highway using Roadside communication Frontend Software.
10. The Roadside Communication Frontend Software shall allow disconnection/ termination of the call by call manager only after the call is answered.
11. The user shall have the facility to request for control of any section of highway outside his rights for a reservation period. Control of the said section is released after the reservation period (Request enhanced control rights for a short duration).
12. ATMS Control Centre may have one or more Operators simultaneously logged in to the Roadside communication software to manage their respective sections of the highway.
13. Each workstation and the associated software should allow up to nine calls to be maintained on hold while the current call is being serviced.
14. Call manager/operator logoff shall be allowed only when no call is in progress or on hold.
15. System should ensure that once recorded, the audio cannot be altered; ensuring the audit trail is intact for evidence purposes.
16. System shall provide sufficient storage of all call recordings for entire period of the contract.
17. The call manager/operator shall have the facility to call back any Emergency Roadside Telephone.
18. The call manager/ operator shall also have the facility to patch any call from the Emergency Telephone to an external telephone line (fixed and mobile), local intercom at the ATMS Control Centre and the local mobile radio network.
19. The call manager/operator shall have the facility to initiate communication health check on any device within his section of the highway.
20. It shall be possible to switch calls. That is, if a call # 1 is in progress, the call manager can open any other call that is in hold status. Call # 1 shall go hold status.
21. The offered system shall have facility to retrieve/export/ backup (on CD, DVD

or Blu-ray recorders) the desired portion of call record (from a desired date/time to another desired date/time) through the search functionality of the application software.

22. It shall be possible to archive old call records and logs on CD, DVD, Blu-ray recorders, or RAID backup devices. Log of any such activity should be maintained by the system for audit purposes.
23. Database Server shall keep track of all configurations, error data, configuration events, usage events and error events.
24. All the workstations shall be provided with software to play recordings, archive and manage calls. However, managers would require sufficient access rights to use play and archive modules.

10.3.8 Speed Display

1. There shall be Software to acquire and manage data from all the Speed Displays within the installation.
2. The software should be capable of managing any number of Speed displays.
3. The software shall operate on open architecture and integrate/ co-exist with other subsystem software that are installed to manage CCTV, VMS, WIM, and Roadside Communication, apart from the Traffic Management module (where applicable) etc.
4. The software shall store configuration (Current Preset Speed limit, Maximum configurable speed limit, etc.) of each Speed Display in the installation. There shall be options to generate reports of stored device configuration.
5. The administrator should be able to create, add, edit & delete users. He should be able to administer access rights to system resources and functionality as well as access permissions to a list of Speed Displays a user can access.
6. The administrator should be able to place users in a hierarchy. The higher priority user should inherit the rights of a lower priority user automatically when he is taking overriding access rights of Speed displays, which are already being accessed by a lower priority user. There should be minimum 3 hierarchical levels of security for providing user level log in.
7. The system shall provide User activity log (audit trail) with user id, time stamp, and action performed, etc.
8. The software shall receive and process packets of real time online data arriving from all the Speed Displays if such a feature is supported by the speed display.
9. The Speed Displays shall be accessed by ATMS Control Centre operators through workstations with the help of Speed Display Control Workstation Frontend Software.
10. The user shall have the facility to request access rights of any Speed Display outside his rights for a reservation period. Access right of Speed display is released after the reservation period (Request enhanced control rights for a short duration).
11. ATMS Control Centre may have one or more Operators simultaneously accessing the installed Speed displays.
12. The Speed Display Software shall have options to check configuration information, remote diagnostics, data/violation record download etc.
13. Database Server shall keep track of all configurations, error data,

configuration events, usage events and error events.

10.3.9 Communication medium and Infrastructure

1. The communication medium and cabling depends primarily on bandwidth requirement, which in turn is driven by the following three major factors:
 - a) Equipment type
 - b) Installation topology and
 - c) Volume (Quantity) of equipment.
2. Since factors a, b, and to some extent c is dependent on vendor solution, a prescriptive specification may be counterproductive. However as a general guideline the following is expected as a bare minimum.
 - a) ATMS Control Centre Internal Cabling – combination of Multimode FO and cat-5E or cat-6 Ethernet
 - b) CCTV – Single mode FO backbone or dedicated point to point RF links (where FO is not possible) with single mode FO, Cat-5e/Cat-6 or copper coaxial links between switches, camera, encoders etc.
 - c) VMS, Speed display and WIM – Low volume traffic can share backbone and switch ports with CCTV. Switch to device may be FO, Cat-5e/Cat-6 or copper coaxial/Twisted pair links. In case the equipment communicates through RS-485 or RS-422, suitable Ethernet to 485/422 converters need to be provided.

10.3.10 Container Office Cabin

1. It shall be a modular and Pre-fabricated for use as ATMS control centre on site where no concrete building is made available on RoW by NHAI.
2. While being light in weight, it shall possess a high structural strength.
3. It shall be spacious enough to house all the ATMS Control Centre equipment (including the Video wall) as well as the operations and maintenance personnel considering the required seating area (as per ergonomic requirements) for each person and appropriate furniture required. Further it shall be possible to ensure the optimal viewing distance for the video wall size required as per specifications provided in the F&T specifications document.
4. It shall provide adequate space for a conference room (with projection facility) to seat minimum 10 persons. There shall further be provision to include two cabins within the facility for use by senior personnel.
5. It shall be provided with appropriate Fire detection, alarm and Fire extinguishing systems.
6. It shall be provided with a suitable access control system.
7. It shall provide adequate Toilet / washroom facilities for the personnel and visitors.
8. The Power supply equipment (generator, UPS etc.) may be housed in an adjacent cabin suitable for the same.

10.4 Key Hardware Technical Specifications

Servers and Storage should be on 10 GbE LAN network. Firewall is mandatory for field hardware and internet connectivity. Detailed minimum technical specifications of the key ATMS Control Centre hardware components are as under:

1. NAS Storage:

CPU	Latest Intel or equivalent AMD Processor with fastest speed available in the market
On-board Memory	8 GB RAM or more as per requirement
Number of HDDs Supported	12x 2.5" or 3.5" SATA 6Gb/s, 3Gb/s hot swappable
HD Drive	As per system requirement
Host Interface	2x 4Gbps Fibre, 2x 1Gbps Copper and 2x 6Gbps SAS Ports
RAID Support	RAID levels 0, 1, 5, 5+, 6, 6+
Network Adapter	Dual-port 10GbE network expansion card
Network Transport Protocols	TCP/IP
Network File Protocols	CIFS, NFS, HTTP/HTTPS, FTP, NTP, SNMP, SMTP, DHCP and DNS
Drive Status/Space Monitoring	Supported
OS	MS Windows or Linux with on-site support
Power supply	Hot pluggable Redundant Power Supply

2. Workstation:

CPU	Latest Intel Processor or AMD with fastest speed available in the market (I7 or above or equivalent in AMD)
Mother Board	Intel Original Mother Board
Memory	16 GB DDR RAM or more as per requirement
Hard Drives	1 TB SSD or more as per requirement
Video Card	2 Nos hardware accelerated for connecting 2 monitors
RAID	Supported
Network Adapter	Integrated 10/100/1000 Base-T
Sound Card	Built-in
Disk writer	CD, DVD and Blu Ray
Monitor/Keyboard/Mouse	21" LED TFT/Multimedia/Optical
OS	MS Windows OS Latest version at the time of tender
Anti-Virus Software	Latest software at the time of tender

3. Camera/File/Database Server

On Board CPU	Latest Intel Processor or equivalent AMD with fastest speed available in the market
Memory	32 GB RAM or more as per requirement
Hard Drives	4 TB SSD or higher as required by design of ATMS with RAID 5 Support (As per requirement in case of camera server)
Disk writer	CD, DVD and Blu Ray
Network Adapter	Dual-port 10GbE network expansion card
Video Card	Hardware accelerated (CUDA based GPU or equivalent in case AI models are centralised)
Screen	21" LED TFT/Multimedia/Optical
OS	MS Windows or Linux Latest version at the time of tender

Anti-Virus Software	Latest software at the time of tender
Power Supply	Hot pluggable Redundant Power Supply

4. NVR

Channels Supported	48
CPU	Latest Intel Processor with fastest speed available in the market
Flash	512Mb (DOM)
LED Indicators	Status, LAN, eSATA, 10GbE
LCD or Better Display	Supported
Number of HDDs Supported	8 x 3.5-inch SATA ; SATA 6Gb/s (backward compatible with SATA 3GB/s)
HDD Capacity	32 TB or more as per requirement
HD Drive	As per system requirement
Hot Swap	Supported
RAID Support	RAID levels 0, 1, 5, 5+, 6, 6+
Gigabit LAN port	4
Recording Modes	Continuous, Scheduled, Manual, Alarm
Pre-event and Post-event Recording	Up to 300 seconds pre and post
Audio recording	Supported
Maximum Resolution Supported	Full HD 1080P (HDMI/VGA output)
Drive Status /Space Monitoring	Supported
OS	MS Windows or Embedded Linux with on-site support
Power supply	Hot pluggable Redundant Power Supply

5. Video Wall Controller

Processor	Intel core-i7 @ 3.4GHz or better
Memory	16GB or More
Hard Disk	2 x 500GB or more in RAID-1 supporting hot-plug and redundant
Ethernet	2 or more Gigabit Ethernet ports
Resolution	Support up to 32768 x 32768 pixel desktop
Graphic card(s)	Multichannel (4 or more) cards 2560 x 1600 @ 60Hz on DisplayPort and 1920 x 1200 @ 60 Hz on DVI
Video Inputs	DVI, DisplayPort, composite, RGB analog, IP Streaming
Input Standards supported	PAL, NTSC, VGA, MPEG2, MPEG4, H.264, MJPG, V2D
Power supply	Dual 230V @ 50 Hz input redundant hot-swap compatible.
Form factor	19" Rack mount
OS	MS Windows or Linux with on-site support

10.5 Environmental Specifications

All the control equipment shall be suitable for operation from 0°C to 45°C and relative humidity up to 80 % non-condensing.

10.6 Testing

1. Functionality testing of all the subsystems
2. Verification/Inspection of servers, switches and other hardware.

10.7 Installation and Power Requirements

1. Power shall be obtained from 230V 50 Hz mains provided on site supported by a minimum 2 x 10 kVA (typical) 3 phase UPS of a standard approved make and a 25 kVA 3 phase Diesel Generator set of a standard approved make. These power back up systems shall provide power of adequate quality and durability to the system in order to meet the service level requirements.
2. Cabling shall be as per standard structured cabling norms.
3. All Server racks to be backed up by suitably rated exclusive on-line UPS of adequate capacity with a backup time of 2 hour or more. The UPS shall be of a standard approved make.

10.8 Maintenance Requirements

1. The equipment supplied shall remain operable for at least 10 years from the date of supply/Installation.
2. The supplier/Service provider shall undertake to support/maintain and (or) provide spare parts till equipment reaches end of life, which shall not be less than 10 years from the date of supply.

10.9 Operational Requirements

Functional software modules supplied and installed at the ATMS Control Centre to handle different operations like CCTV, VMS etc. shall be able to integrate with/Export data to and import data from the ATMS unified database located in ATMS Control Centre servers.



Chapter 11 Other Relevant Standards and Codes

11. Standards

Equipment and equipment installation shall comply with the latest revision of the applicable Bureau of Indian Standards (BIS). Where no BIS exists for any aspect of equipment manufacture, supply, installation, identification, protection, testing or operation, then the relevant IEC or ISO standard shall apply. CEN or CENELEC standards shall apply where no BIS, ISO or IEC standards exist.

With respect to the above some of the specific standards / Code of Practices include the latest versions of the following:

Sl No	Standard	Relevant to
1	IRC SP 85/ IRC67	For Variable / Changeable message signs
2	IS / IEC 61508	Functional safety
3	IS 14700, CENELEC EN 50081-1; CENELEC EN 50082-1;	EMC compatibility/ EMC Emission compliance/ EMC Immunity
4	BIS 732 or BS 7671	Electrical wiring installation (BIS 732) or Wiring Regulations (BS 7671)
5	IS 2309	Lightning protection
6	IS 3043	Electrical Earthing
7	IS 5216	Safety procedures and practices in Electrical works
8	IS 7689	Control of undesirable static electricity
9	IS 694, IS 1554	PVC Insulated Cables
10	EN 61280-4-1	Fibre-Optic field test related
11	IS 14927	Cable Trunking & Ducting systems
16	EN 50173	Generic/structured cabling
17	IEC 60529	Degrees of Protection provided by Enclosures
18	IS 9000 Part XIV Sect. II	Change of temperature test
19	IEC-571; IS: 9000 Part-III Sect 3	Dry heat test
20	IS 9000 Part II Sect. III	Cold test
21	IS9000 Part V Sect.2 Variant 1	Damp heat test (Cyclic)
22	IS9000 Part IV	Damp heat test (Steady state storage)
23	IS9000 Part XI procedure 3	Salt mist test
24	IS 9000 Part XII	Dust test
25	IS 9000 Part VII, Sec. 2	Bump test
27	BS1363	240V Power Outlet

Sl No	Standard	Relevant to
28	IEEE C62.41 CLASS A or BS EN 62305	Surge Protection
29	IEC 60297 or DIN 41494	Mounting Racks and Shelves
30	ISO 14001	Environment Management System
31	IS456, IS13920, IS1891	Civil Works



Chapter 12 Use of ATMS during Disaster Management

12.1 Introduction

A disaster may be defined as an incident that:

- a) Directly affects life and/or health of many people,
- b) Adversely affects the environment resulting in an altered environment proving to be detrimental to human wellbeing
- c) Damages material assets on a large scale.

Disasters may broadly be of three types:

- a) Natural disasters such as floods, earthquakes etc.
- b) Human systems failures such as a dam collapse, building collapse and more importantly those related to Chemical, Biological, Radiological and Nuclear (CBRN) emergencies.
- c) Conflict based disasters such as war, terrorism etc.

As the consequences of a disaster invariably are on a larger scale, the standard tools and operating procedures for managing emergencies at facilities like hospitals, highways etc. may turn out to be inadequate. Thus quickly allocating additional resources commensurate with the scale of the event and establishing procedures to enable its coordinated use by services and agencies of different disciplines would assume paramount importance in disaster management.

A very important goal of a good Disaster Management (DM) strategy is to ensure sustainable mobility during disaster events, as only this in turn can ensure the realization of important goals of saving lives and reducing economic damage. Thus the relevance of a highway in Disaster Management arises from this context i.e. as an invaluable lifeline for evacuation of those affected by a disaster and for reaching relief supplies to the affected areas. Further highways themselves are vulnerable to disasters in the form of floods, earthquakes etc. Any disaster that befalls a human settlement also affects the highway(s) connecting it to the rest of the world.

The highway ATMS with its capability to 'sense and capture' the conditions on the highway and its environment, its ability to support structured decision making and implementation, as well as its versatile road-user communication via on-road equipment and mobile devices, becomes a valuable tool to strongly enable the highway's role as the core lifeline.

12.2 Disaster management framework in India

The National Disaster Management Authority (NDMA) is the apex agency having the responsibility for laying down policies, plans and guidelines for Disaster Management and coordinating their enforcement and implementation for ensuring timely and effective response to disasters. The above guidelines assist the Central Ministries, Departments and States to formulate their respective DM plans to be subsequently approved by the NDMA. The National Executive Committee (NEC) playing the role of the executive committee of the NDMA, the State Disaster Management Authority (SDMA), the District Disaster Management Authority (DDMA), the National Disaster Response Force (NDRF) and the National Institute of Disaster Management are the associated institutions that play important roles in disaster management in India.

12.3 Phases in Disaster Management

The phases include Mitigation, Preparedness, Response and Recovery. During the Mitigation phase, although not time critical, it is important that all related organizations get interconnected with adequate data / information transfer. During the preparedness phase, which is however time-critical, the warning data regarding the disaster is shared among the above organizations. The response phase requires the establishment of critical on-line communication between the organizations and the affected public for achieving quick response to the disaster events. The recovery phase, again not time critical, involves the sharing of large amount of data between organizations for the acts of reconstruction, lessons learnt etc.

12.4 Highway management agency's perceived role vis-à-vis the Disaster Management framework

It can be seen that the Highway Management Agency has to play the role of an organization actively involved in all phases of the Disaster Management listed above. Specifically, among the above institutions related to Disaster Management in India, the DDMA (under the leadership of the District Collector / District Magistrate) acts as the planning, coordinating and implementing body for DM at the District level and takes all necessary measures for the purposes of disaster management in accordance with the guidelines laid down by the NDMA and SDMA. Thus it logically follows that it is with the DDMA and its associated institutions each highway management agency has to interact with to derive and play its coordinated part in disaster management. Further the highway management agency should actively support the NDRF with adequate information (visual and other) when actively engaged in responding to a disaster situation.

With the DDMA a three phase interaction is required. In the initial planning phase the specific role of the highway management agency in DM is evolved along with the checklists required to be included in the ATMS for implementation during DM. The second phase includes the on-line sharing of highway status and other important information collected by ATMS. The third phase, after the DM phase is concluded, is an interaction to evaluate performance and generate lessons learnt to help enhancement of the checklists.

A schematic of the envisaged interaction is shown in figure 1 below:

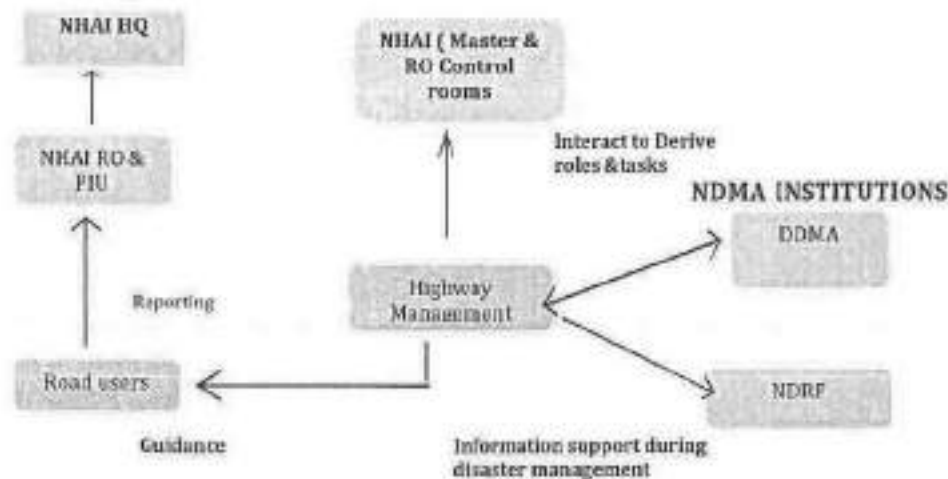


Figure 1 Envisaged interaction of Highway Management for DM

[Handwritten signature]

12.5 Role of ATMS during Disaster Management

The ATMS is the single most important tool for use by the highway management agency during disaster management. Table 1.0 below lists out the services that can be provided by the ATMS.

S. No	Beneficiary	ATMS service	Delivery Media
1	Road User	a) Highway status information including i) Flooding and potential flooding of highway locations, bridges ii) Traffic Status / congestion on various sections of the highway and other highways / roads connecting to it. iii) Estimated Travel times iv) Highway ride quality v) Adverse weather conditions vi) Alternate roads open / closed status vii) Law & order issues on specific locations	a) Variable Message Signs b) NHAI Mobile App
2	Road User	Specifics of above information in the form of Question / Answers	Support via the National highway Emergency help line
3	NDRF	a) Road status as above including Estimated travel times b) Best routes to reach affected areas	a) Specific NHAI Mobile App b) Via direct audio communication with the ATMS Control Centre c) Via visit to the ATMS Control Centre to examine the highway status and discuss plan of action (a).

Table 1.0 Services provided by the ATMS for Disaster Management

12.6 Enhancement of ATMS for Disaster Management

In order to play an effective role during DM the ATMS shall be enhanced at least with the following facilities.

- Satellite telephone at the ATMS Control Centre to communicate with the NDRF and related agencies. This is expected to be provided by NDMA.
- Establishing a temporary Satellite data link at the ATMS control centre to transfer data on-line to the NHAI RO and Master control rooms in case of failure of the existing data link (e.g. MPLS) at the control centre.
- Portable high bandwidth (Microwave) wireless communication equipment to re-establish data links where the Fibre optic connectivity has failed (due to physical cable damage) due to flooding / earthquake etc.
- Establishment of an automatic software driven checklist for disaster management as part of the Incident management module of the ATMS software. The checklist shall be generated for the highway in consultation with the DDMA for various types of disasters.

Appendix – A - GUIDELINES / RATIONALE FOR LOCATING - ATMS DEVICE / SYSTEM

S. No	ITS Device / System	User Need / Application	Rationale for Equipment location
1	PTZ CCTV Camera for TMCS with basic analytics	To monitor traffic conditions (Day & Night) on the highway stretch including junctions, curves, ramps	Min. 1 camera per km, alternating on both sides or on median. Additional cameras to be put up depending on non-linear structure, clovers, interchanges etc such effective surveillance of the entire highway stretch is achieved.
2	VIDES (Overview and ANPR Cameras) for VIDES with videoanalytics, enforcement and supported with local warning lights/VMS and e-challans generation	To automatically detect violations of traffic rules and collect evidence for eChallan Generation. Further, monitor (Day and Night) and warn road users on the main carriageway about dangerous traffic conditions (e.g. Contraflow, stopped traffic at Service road merger points, blind turns on the main carriageway & junctions with considerable traffic	<p>Min. 1 VIDES at every 10 km covering each side of Highway. Exact location of the VIDES should be such that it is placed facing accident and incident prone areas (blackspots, potential accident spot locations, clovers, interchanges, busy junctions etc). Additional VIDES can be put up depending on number of such locations as per audit by NHAI or Road Safety Experts or Recommendation of Local Traffic Police.</p> <p>Provision of warning with flashing lights: 150 m before the area of detection 250 m before the area of detection to warn arriving vehicles.</p> <p>Provision of VMS linked to VIDES on Blackspots or high accident prone locations decided by PD, NHAI: 150 m before the area of detection 250 m before the area of detection.</p> <p>If warning VMS is used then warning flashing lights may not be used on that location.</p>

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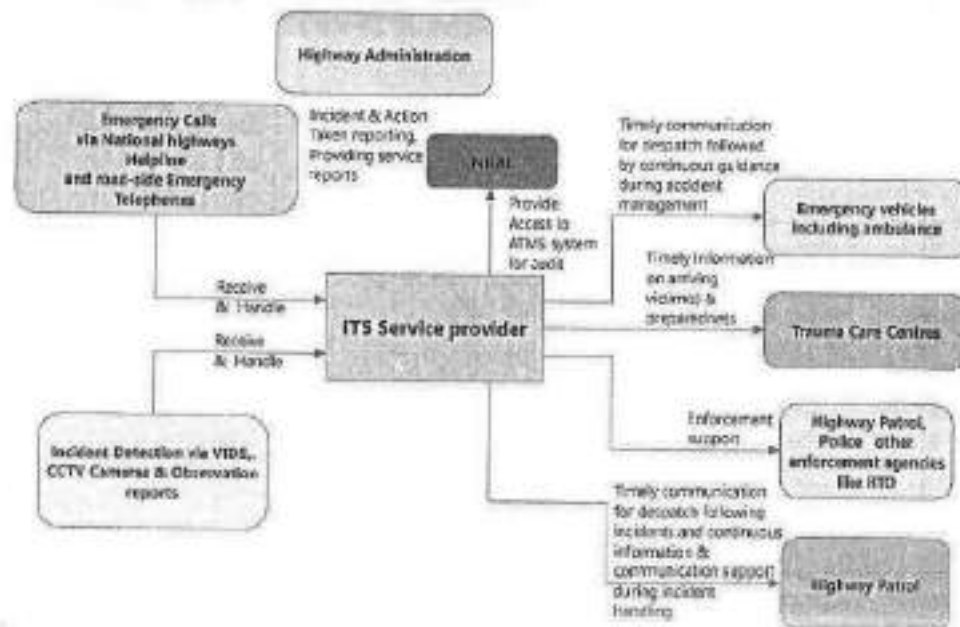
S. No	ITS Device / System	User Need / Application	Rationale for Equipment location
3	VMS Displays (Full Gantry in 4/6 Lane Highways/ Expressways and L Type in 2L+PS Highways, Blackspot Locations, Major Junctions with NH/Expressways)	To inform/warn/guide road users at start of highway stretch & important junctions on highway conditions for travel planning	At entry and exit of Project stretch, Blackspot locations, Major Junctions with NH/Expressways Minimum visible distance on the highway: 250 m Message languages: Hindi, English & Local language
4	VMS (Portable)	To provide local guidance to road users at locations of traffic incidents & road works	Minimum 2 in each Project to be Temporarily deployed before locations related to road works and incidents affecting traffic movement. Message languages : Hindi, English & Local Language
5	Emergency Roadside Telephone	To enable a caller from the highway to provide urgent messages on Accidents/ Incidents and road congestion for supporting the Emergency response System	Only for Zones experiencing telecom blackspots along highway need to be provided by ERT. On long highway stretches (> 2 km) suffering from telecom blackspots, ERT to be located at every 2 Km on both sides of the highway stretch.
6	Vehicle Actuated Speed detection and warning system	To warn road users on over speeding	Gantry Mounted System to be located after every 20km with minimum 2 in each package. Exact of Location of VASD shall be such that it is at maximum distance from nearby VIDES to avoid duplication as VIDES takes care of speed violation as well whereas VASD is just for warning. Further, overspeeding prone areas may be considered for exact placement.
7	Mobile Communication System	To support the O&M team in traffic management and system maintenance	Mobile wireless towers (towers for the main base station and repeater stations) to be appropriately designed and quantities arrived at depending mainly on the highway terrain. Handsets with relevant members of the O&M team along with Portable/Mobile wireless sets on O&M vehicles
8	ATMS Control Centre	Using a suitable electronic and IT system (hardware and software) integrated with the ATMS field equipment, it	Typically at 1 location per 100 km for a highway or one per project depending upon the scheme

S. No.	ITS Device / System	User Need / Application	Rationale for Equipment location
		supports centralized Monitoring of highway stretch, receiving emergency calls and active management of accidents including providing system aided guidance and supervision of rescue and traffic Management activities	



Appendix B - Service Level Agreements and Penalties During O&M Period

ATMS SERVICE PROVIDER'S MAIN OPERATIONAL FUNCTIONS AND
INTERACTION WITH OTHER STAKEHOLDERS



Operational Functions

1. Routine monitoring of Highway Traffic to detect abnormal traffic and incidents
2. Receiving Emergency calls via road-side Emergency Telephones and 24x7 National highways help line
3. Management of incidents received via live Video Incident Detection Systems & reports from agencies like Highway patrol and others (e.g. damage to road, chemical spillage on road etc)
4. Accident Management on the Traffic Management console including
 - Accident evaluation & timely communication for Dispatch of Emergency vehicles and Highway patrol vehicles
 - Selection of and timely communication to selected trauma care centres
 - Timely Communication to Road Users via on-road (PMS) and personal devices (Mobile Apps) to the road users on the accident and related traffic guidance
 - Continuous monitoring of progress of Emergency vehicles
 - * Progress of Ambulance(s) towards trauma care centre(s)
 - * Progress of vehicles involved in Traffic Neutralisation
 - Providing relevant information to all stakeholders when required or as on demand including information for enforcement with evidence like captured video and data
 - Reporting to Highway Administration and NHAI
 - Time and place of accident
 - Time of communication to Emergency Vehicles
 - Time of vehicle(s) reached to the trauma care centre(s)
 - Time of traffic normalisation
 - Adequately meeting Service levels

Service Level Agreement (SLA) shall become part of Agreement between Employer and the SI. SLA defines the terms of the SI's responsibility in ensuring the timely delivery of the deliverables and the correctness of the same based on the agreed Performance Indicators as detailed in this section. The SI has to comply with Service Levels requirements to ensure adherence to Project timelines, quality and availability of services.

It will be the responsibility of the SI to supply software/automated tools to monitor all the SLAs mentioned below. Unless otherwise specified, calculation of SLAs should be automated through system generated reports.

Note: Penalties shall not be levied on the SI in the following cases:

1. There is a Force Majeure event effecting the SLA which is beyond the control of the SI including natural disasters, adverse weather conditions or network issues attributable to the ISP (to be determined through investigation by the concerned authority).
2. The non-compliance to the SLA has been due to reasons "beyond the control of the SI". Theft cases by default would not be considered as "beyond the control of SI" and will be decided on a case-to-case basis. Damages due to any accident/mishap shall be considered as "beyond the control of SI". However, Power shutdown or deliberate damage to field devices such as Cameras, Audio Systems etc., would not be considered as "beyond the control of SI".
3. If there is power-outage in the main grid beyond the necessary backup time, the same may be considered as "beyond the control of SI" after due case and intimation has been made to NHAI regarding the same.

The purpose of this Service Level Agreement (hereinafter referred to as SLA) is to clearly define the levels of service which shall be provided by the SI to the Employer for the duration of this Agreement.

Payment Terms:

The SLA metrics provided specifies performance parameters as scoring method, termination trigger and measurement mechanism. Irrespective of payment duration, all SLA calculations, breach conditions and deductions thereon will be done considering quarterly time period. The SLA also specifies the liquidated damages for lower performance and breach conditions. Payment during the O&M phase is linked to the compliance with the SLA metrics. The matrix specifies three levels of performance, namely,

1. The contractor will get 100% of the Contracted value due for the period (as per the 'Payment Schedule' section of the Terms of Reference) if all the baseline performance metrics are complied with and the cumulative credit points are 100
2. The contractor will get lesser payment in case of lower performance. (For e.g. if SLA pointscore is 80 then the SI will get 20% less on the periodic O&M payment - The formula calculating the deductions is $(100 - \text{SLA Point Score})\%$).
3. In case the overall performance is less than 50% in the quarter, no amount will be paid for the entire quarter.
4. In case the score falls below 50 for two consecutive quarters, the Authority can invoke the termination clause.
5. If the performance of the Agency in respect of any parameter falls below the prescribed termination trigger (In terms of performance metric for a specified time period), the concerned authority will have the right to invoke the termination clause. The periodic payment during O&M phase shall be made after deducting for lower performance as mentioned above. The aforementioned SLA parameters shall be measured as per the Individual SLA parameter requirements and measurement methods, through appropriate SLA Measurement tools to be provided by the Contractor and audited by NHAI or nominated representative for accuracy and reliability.

NHAI shall also have the right to conduct, either itself or through any other agency as it may deem fit, an audit / revision of the SLA parameters. The definition of SLAs, shall be reviewed by NHAI on an annual basis after consulting the SI, Project Manager and other experts.

Performance Area	Scoring	Termination Trigger	Measurement Mechanism
Emergency Calls All calls from 1033 or Emergency Telephones are to be answered in less than 30 seconds of calling.	5 points if all emergency calls are picked in less than 30 seconds in first attempt 0 points if 1 or more calls have been missed.	If 0 points in any two quarters in a 12 month period.	Daily shift-wise logs accounting for handling of ALL calls and action taken, time to resolve etc. Authority may take report from 1033 Call Center for actual or mock calls to assess whether SLA has been agreed upon. The same can be used for calculation of penalties.
VIDES Automatic detection of all incidents (categorized as real-time in 4.3.2) in areas under camera surveillance.	10 points for 0-5 missed incidents 5 points if >5-10 missed incidents 0 points if more than 10 missed incidents.	If 0 points in any two quarters in a 12 month period.	Manual detection of select incident categories on the stretch which is not logged by the Command Centre software automatically through VIDES or TMCS software. NHAI may randomly audit videos collected under VIDES cameras to check this SLA.
VIDES Incident Detection Precision below acceptable limits.	10 points if all Incident Types meet their required Precision Criteria 5 points if only 2 or less incident types are not meeting required Precision Criteria 0 points if more than 2 Incident Types are not meeting Required Precision Criteria	If 0 points in any two quarters in a 12 month period.	By randomly assessing automatically detected incidents and manually assessing through video whether they were correctly flagged or not (Eg. <i>VIDES says wrong-lane driving but on manually checking video it is correct lane</i>).
VIDES Uptime - Hours All cameras in a VIDES unit have to be functioning for the VIDES unit to be considered up. (irrespective issues with power, network etc)	10 points if >= 95% 5 points if >= 90% and < 95% 0 points for < 90%	If 0 points in any two quarters in a 12 month period.	Network Management System with real-time access provided to NHAI or nominated representative.

Performance Area	Scoring	Termination Trigger	Measurement Mechanism
TMCS Uptime Hours cumulatively i.e. total number of hours each TMCS camera has been up/(number of cameras x total hours in billing period)	10 points if >= 95% 5 points if >= 90% and < 95% 0 points for < 90%	If 0 points in any two quarters in a 12 month period.	Network Management System with real-time access provided to NHAI or Nominated Representative.
TMCS Automated or Manual Detection of all accidents and stalled vehicles in areas under camera surveillance in less than 90 seconds of occurrence of event	10 points if 0 accidents or incidents missed in detection in less than 90 seconds 5 points if >1 and <=5 accidents/incidents missed in detection in less than 90 seconds 0 points if >5 accidents/incidents missed in detection in less than 90 seconds	If 0 points in any two quarters in a 12 month period.	By manually assessing recorded videos of TMCS and comparing with the ticketing system where each and every accident/incident is logged. If accident/incident is not logged, it will be considered a violation.
ANPR Accuracy of ANPR cameras	10 points if >= 95% 5 points if 90-95% 0 points if < 90%	If 0 points in any two quarters in a 12 month period.	SI will auto-generate reports on number of number plates that were wrongly read and/or missed completely from reading. Further, NHAI or nominated representative can conduct random audits on the recorded footages from any ANPR cameras
eChallan Validating and Uploading evidence on Government's eChallan software for processing in less than 48 hours of Violation Occurring	5 points if zero offences have been missed in uploading 2.5 points if >0 and <=5 offences have been missed in uploading 0 points if more than 5 offences have been missed in uploading	If 0 points in any two quarters in a 12 month period.	By auditing the incident generation time on the VIDES software with the eChallan upload receipts/time.
Incident Response Dispatch of Ambulance/RPV in less than 90 seconds of occurrence of accident/incident	5 points if zero instances of dispatches took more than 90 seconds. 2.5 points if 1-3 instances of dispatches took more than 90 seconds minute 0 points if >3 instance of dispatches took more than 90 seconds	If 0 points in any two quarters in a 12 month period.	By auditing the incident generation time on the VIDES software the time in which the RPV/Ambulance was notified about the incident through call/radio any other accepted mechanism as logged. NHAI may conduct mock-drills as well to check this SLA

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Performance Area	Scoring	Termination Trigger	Measurement Mechanism
Video Wall 99% uptime in the billing period	5 points if $\geq 99\%$ 2.5 points if $\geq 95\%$ and $< 99\%$ 0 points for $< 95\%$	If 0 points in any two quarters in a 12 month period.	Network Management System with real-time access provided to NHAI or Nominated Representative.
ATMS Command Centre Overall application availability at Command Centre	5 points if $\geq 99\%$ 2.5 points if $\geq 95\%$ and $< 99\%$ 0 points for $< 95\%$	If 0 points in any two quarters in a 12 month period.	Network Management System with real-time access provided to NHAI or Nominated Representative.
Variable Messaging System Uptime Target Uptime = Number of VMS x Number of Hours in Billing Period	5 points if $\geq 95\%$ 2.5 points if $\geq 90\%$ and $< 95\%$ 0 points for $< 90\%$	If 0 points in any two quarters in a 12 month period.	Network Management System with real-time access provided to NHAI or Nominated Representative.
Variable Messaging System Usage Whether VMS was updated with relevant information when relevant incident was detected in proximity of VMS (Chapter 4 VIDES).	5 points if 0 instances where incident was detected by VIDES but not updated on nearby VMS. 2.5 points if > 0 and ≤ 5 instances where incident was detected by VIDES but not updated on nearby VMS 0 points if more than 5 missed instances	If 0 points in any two quarter in a 12 month period	By auditing system generated VIDES and VMS logs.
Vehicle Actuated Speed Display Target Uptime = Number of VASD x Number of Hours in Billing Period)	5 points if $\geq 95\%$ 0.5 points if $\geq 90\%$ and $< 95\%$ 0 points for $< 90\%$	If 0 points in any two quarters in a 12 month period.	

Instance Based Deductions

These deductions are to be levied for each violation that occurs. These deductions are applied to the periodic O&M bill over and above the SLA based payment calculation above. Instance based deductions are incremental and cumulatively add up.

Instance	Criteria	Penalty
API based Data Sharing with NHAI ERP/MIS System	API or Upload based sharing of reports from ATMS software to NHAI ERP as prescribed in the contract and any notification/circulars issued from time to time.	5000/- per instance of data sharing missed by SI at prescribed schedules.

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Instance	Criteria	Penalty
Remote Video Check NHAI should be able to access any Remote TMCS or Overview camera through IP and authentication details provided by Command Centre at all times.	If for any reasons (wrong IP/password, network downtime etc) the footage is not visible then it will be considered a violation. Simple screenshot with datetime visible shall be enough to prove violation by NHAI. If SI has not uploaded/registered camera details on ATMS Module on NHAI ERP/MIS it shall also be considered violation as part of this.	5000/- per camera per day. Same camera will not be checked again in the same day if violation found and recorded.
Non-availability of video recording of accident occurred in surveillance zone of TMCS or VIDES	Self-explanatory	Rs 25,000/- per instance

Note: Any downtime for maintenance should be within the SLA periods and with written intimation to NHAI. Only in special circumstances and in written consideration of the PD that the downtime may extend SLA period.

All SLAs (instance based on percentage based) are mutually exclusive. For eg. If 2 incidents go unnoticed during unplanned downtime of the VIDES cameras, it will still be considered a breach of SLA regarding incident detection.

Non Compliance to Safety Standards at Site

Failure by the System Integrator's personnel in maintaining the safety standards at the site at anytime shall attract penalty on every instance noticed by NHAI (or its representatives).

- Staff working without safety gears – penalty of INR 10,000 per instance. In case of repeated instance by the same staff member of the System Integrator, the penalty shall be doubled per instance. The System Integrator shall have to replace the repeated offenders /sub-System Integrator (safety lapses more than 3 times) with immediate effect.
- Improper safety measures at site / safety hazard to the commuters due to poor workmanship, etc., / System Integrator's vehicle wrongly parked at site / System Integrator's vehicle moving in wrong direction / working during low visibility hours or at night time without proper safety measures warning signages and lighting/ improper traffic diversion / nonstandard warning signages etc. / unauthorized lane closure / traffic rule violation – minimum penalty of INR 1,00,000 per instance shall be imposed on recommendation of NHAI (or its representatives). In case of repeated instance, the penalty shall be doubled per instance. The System Integrator shall have to replace the repeated offenders / sub-System Integrator (safety lapses more than 2 times) with immediate effect. NHAI or its representatives shall also take legal action against the errant staff / sub-System Integrator of the System Integrator, as such safety lapses may lead to major safety concern/ hazard for the road users as well as the workers.

Penalty for Delay in Staff Mobilization and/or Absence Post Mobilization

Delay in submission of detailed written statements and/or mobilization of Key Personnel in O&M period (Section 1.1 in Appendix C) shall attract penalty @ INR 5000/- (Rupees Five Thousand) per day per Personnel. In case the delay is more than 3 weeks, NHAI reserves the right to invoke the Bid Securing Declaration and PBG towards the aforesaid penalty and may proceed with the revocation of LOA or termination of the project, as the case may be. In case of post-mobilization mobilization, the same penalty will be applicable for each day of absenteeism. Service Provider has to have replacements at all times and ensure 100% staff

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availability. Replacements have to be informed to PD in writing beforehand and to be well trained and meeting qualification requirements. Attendance of all staff and replacements is to be monitored through biometric system.

Penalty for Data Manipulation, Fudging or Other Fraudulent Practices

If the System Integrator is found manipulating any data that it reports or stores (including SLA reports but not limited to), a penalty of Rs 10,00,000 will be imposed with an warning and the if the fudging was related to SLAs the entire due amount for that quarter will be deducted. For any repeat instance of data fudging or manipulation, NHAI may consider termination of the contract and forfeiture of performance bank guarantee.

Penalty for Data Breach or Mis-use of Data

As per provisions of Digital Personal Data Protection Bill, 2023 or any other relevant acts or rules notified by the Government. The ATMS provider will be governed as a Data Fiduciary and the principles so prescribed under the DPDPB'23 Act.

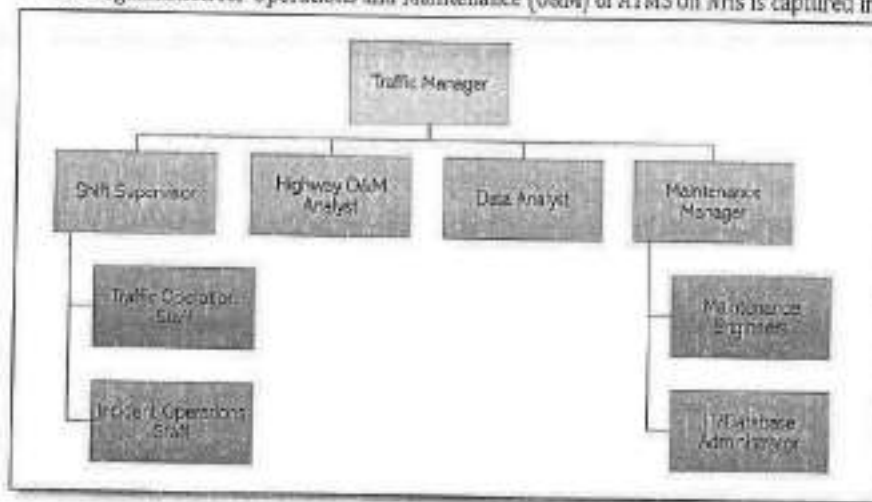


Appendix C – ATMS Control Centre Organization and Staffing

1. ATMS Control Centre Organization and Staffing

1.1 The Organization

The organization for Operations and Maintenance (O&M) of ATMS on NHs is captured in figure below.



Minimum educational qualifications and experience of the ATMS Control Centre personnel is summarized below.

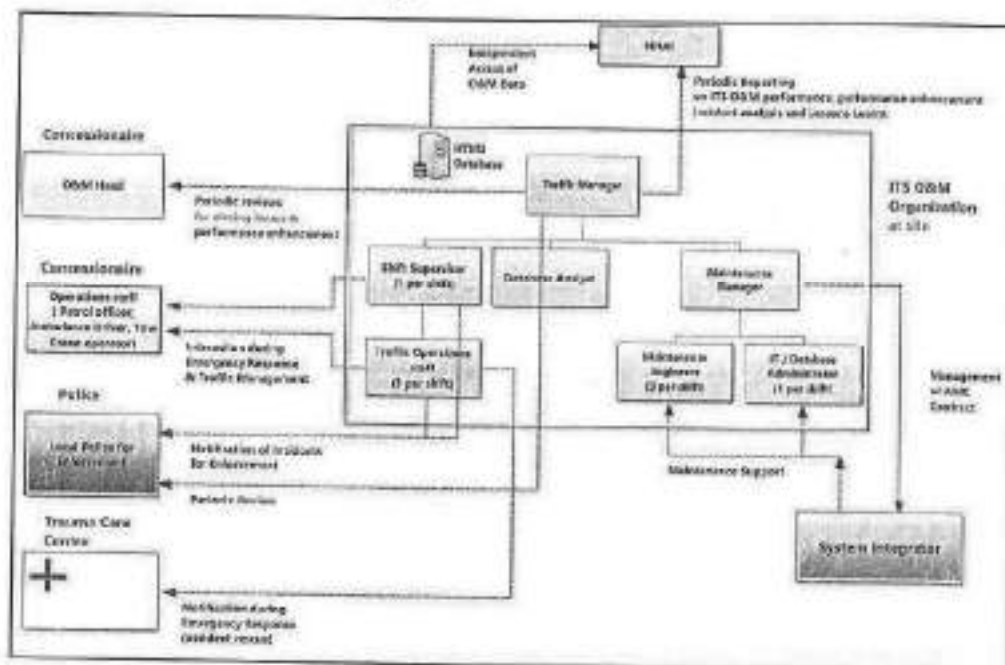
No	Role / Position	No of Personnel	Minimum Qualifications	
			Educational	Work Experience
1	Traffic manager	1	Engineering Graduate in Civil Engineering with Traffic Management Elective	Minimum 5 year experience in managing Control room operations in Highway Traffic management
2	Shift Supervisor	3 (1 per shift)	Graduate (preferably Science)	Minimum 3 year experience in a similar position in Highway Traffic Management
3	Traffic Operations Staff (One person shouldn't be seeing more than 15 TMCS cameras)	(Number of TMCS Cameras/15) People per shift) Total 3 shift.	Graduate (preferably Science)	Minimum 2 year experience in a similar position in Highway Traffic Management.
4	Incident Operations Staff	1 per 5 VIDES per system	Graduate	3 years of experience
5	Maintenance Manager	1	Engineering Graduate in Electronics	Minimum 5 years in maintenance

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				management of similar systems
6	Maintenance Engineers	9 (3 per shift)	Diploma in Electronics and Certificate course in Network Management	Minimum 3 year experience in maintaining similar systems.
7	Database / IT admin	3 (1 per shift)	MCA or Graduate in Engineering	Minimum 6 year experience in maintaining Similar systems, Databases, IT setups (hardware and software)
8	Data analyst	1	MCA or Graduate in Engineering	Minimum 3 year experience in Data analysis, visualization and Business Intelligence.
9	Highway O&M Analyst	1 (only day shift)	Graduate or Diploma (Civil related)	Minimum 3 years of experience in Highway O&M Inspections

1.2 Stakeholder Interaction

Proposed interaction between members of the O&M organization and their interaction with the stakeholders is shown in figure below.



O&M Team - Stakeholder Interaction

- 1.3 Dedicated Vehicle should be deployed 24x7 for attending maintenance requirement of ATMS.
- 1.4 Aadhaar biometric based attendance system should be there for all staff and monthly system generated attendance reports should be submitted. Any change in personnel has to be reported by the Concessionaire to Authority in writing before the change has taken place. If any staff other than reported staff is found present in the command centre, it will lead to penalties pertaining to absence of expected staff.

2 Operations of the ATMS

2.1 Essential operations

The essential operations related to the proposed ATMS include a) routine monitoring of the highway and b) Managing accidents / incidents on the Traffic management and rescue console. They are required to be appropriately carried out by the Traffic Operator with suitable support from other staff.

2.2 Roles of members of the Operations team

2.2.1 Highway O&M Analyst

TMCS cameras provide view of the entire highway. The role of the Highway O&M analyst will be to scan the TMCS feeds to identify Highway O&M defects (potholes, illegal encroachments, illegal median openings etc) on the highway that can lead to road-safety concerns and report them to NHAI's O&M Module/App through dedicated login created for the ATMS system.

2.2.2 Traffic Operator

a) Routine monitoring of the highway including

- i. Handling Emergency Calls on the Emergency Call console(s) for calls originating from roadside emergency telephones and those received from '1033' National Highways Incidence Management Helpline Number, making incident reports and alerting the Traffic operator manning the Traffic management and rescue console.
- ii. Traffic monitoring
 - a) Visual monitoring using CCTV cameras located along the highway.
 - b) Data evaluation of traffic flow measured by the Incident detection systems.
- iii. Monitoring of movement of utility vehicles (Ambulance, Patrol Vehicles and breakdown cranes) via GPS tracking supported by CCTV monitoring.
- iv. Monitoring of the status of the ATMS system including the operational status of each ATMS system / subsystem (in the field and in the ATMS Control Centre). This also includes receiving and recording any third-party (e.g. road user) complaints on system malfunction (e.g. VMS display).
- v. Monitoring the road maintenance works currently in progress and the deployment of suitable ATMS for road safety countermeasure. This will also include disseminate necessary precaution against road damage(s) and prone to potential accidents.
 - a) Suitably locating mobile VMS near maintenance sites
 - b) Selecting and enabling the sending of appropriate messages via VMS and Mobileapps
- vi. Logging of the above activities on a log book with adequate details including the Date and time, detailed system status including major / minor faults, if any.
- vii. Generation of following shift-wise reports
 - a) Incident report (e.g. those detected by the Incident detection system).
 - b) Emergency Call report with incident details.
 - c) Event report related to system status and system operation.
 - d) Traffic count report at specific locations.
 - e) Report of messages displayed on Variable Message Signs.
 - f) Weather status report.

- g) Accident report including details of action taken in rescue of victims and traffic restoration.
- h) Traffic movement report of Utility vehicles (Patrol vehicles, Ambulances and breakdown crane.
- i) Asset status report including the status (whether present and the operational status) of all ATMS assets down to each equipment.
- j) System performance report in terms of adequate quality and speed of response. This report shall integrate the status of individual equipment from the network management system.
- k) Operations personnel Attendance report.

b) Managing accidents / incidents:

- i) Operation of the Traffic management and rescue console and facilitate guidance to highway patrol perform their role on the ground.
- ii) Facilitate decision making based on the information provided by the ATMS system and adequate communication with the stakeholders participating in the rescue and traffic normalization. Communicate with the stakeholders by providing them with the necessary information (e.g. providing accident details to the police) in a timely manner and taking in essential information for effective decision.
- iii) Ensure that the rescue and traffic normalization actions are logically concluded.

2.2.3 Shift Supervisor

- a) Oversee and provide guidance to the Traffic operators in carrying out their functions.
- b) Interact with the stakeholders in a manner to support Traffic operators.

2.2.4 Data Analyst

This is essentially a supportive role and involves following:

- a) Perform analysis on 'Big Data' collected and stored in the ATMS database and provide insights on the highway's performance (Traffic volume, disruptions, accidents, repeat incidents, Operational effectiveness, etc.) to the Traffic Manager.
- b) Generate and provide specific 'on-demand' analytical reports to the Traffic Manager and NHAI PD for process improvement.

2.2.5 Traffic Manager

The Traffic manager oversees the complete operations at site. The role mainly includes

- a) Monitoring the operational efficiency of the team. This includes the analysis (based on system reports and direct observation) of the team's performance and determining the gaps for improvement.
- b) Improving Operational procedures based on the above analysis
- c) Planning and implementing training programs for the team based on the above analysis.
- d) Interaction with stakeholders
 - i) As a matter of support during routine operations and accident management
 - ii) For evaluating team performance and planning improvement strategies and actions for rescue, traffic normalization and traffic enforcement.
- e) Play the role of the administrative head at site.
- f) Reporting to the O&M top management on team performance

2. Maintenance

2.1 Maintenance Functions

The Maintenance function consists of the following activities:

- 2.1.1 Scheduled/Routine Maintenance Service - This involves the provision of routine maintenance service on all systems, system components and ancillary equipment to meet the service level requirements.
- 2.1.2 Breakdown/Corrective Maintenance Service - This involves the provision of maintenance service in case of breakdown (i.e. repair) on all minor/ major systems, system components and ancillary equipment to meet service level requirements.
- 2.1.3 Software Upgrades - This involves the implementation of new versions of software released time to time by the system integrator.
- 2.1.4 Verify System Calibration - Calibration will be performed periodically and / or as per manufacturer's requirements on each relevant equipment.
- 2.1.5 Software Support Service & Network Solution Service - This involves Data management, Software And Network Solution Support Services.
- 2.1.6 Technical Support - This activity is to provide engineering and technical support as and when required;
- 2.1.7 Provide Spare Parts Supply and Management. It is important to hold, at any point of time, adequate spares to enable meeting the service level requirements.

2.2 Routine Maintenance Function

The objective of electronic equipment maintenance shall be to ensure reliability, to enhance its economic life and to improve its efficiency. Routine maintenance consists of a fixed set of checks, measurements, cleaning and calibration. These activities shall be based on Equipment Service Provider's specifications and general maintenance practices that include but not limited to:

- 2.2.1 Checking the condition of components, e.g. check connections for signs of deterioration.
- 2.2.2 Preparation of planned yearly/ monthly routine maintenance schedule.
- 2.2.3 Perform the maintenance works as per agreed schedule. Any Changes to the schedule shall be notified to NHAI by submitting the Change Routine Maintenance Schedule.
- 2.2.4 Provide timely information to the operations team on the planned maintenance work so that adequate advance communication can be provided to the road user and proper traffic guidance actions taken.
- 2.2.5 Check voltage levels: Power supply levels are crucial to the effective operation of electronic equipment. Borderline levels could lead to intermittent faults and damage to components.
- 2.2.6 Voltage level changes are caused by the deterioration of capacitors, transformers and semiconductor components.
- 2.2.7 Certain measurements can also be performed to check the status of elements of the system, i.e. Impedance and Isolation tests.
- 2.2.8 Mechanical components need routine cleaning and lubrication to ensure their effective operation.
- 2.2.9 Preparation and submission of monthly performance report.
 - Summary of rectification of notified problems.
 - Maintenance schedule and actual date of maintenance works.
 - Records of communication on the occurrence of delay of routine maintenance and rectification works.
- 2.2.10 Rapid rectification of defects found during routine maintenance.
- 2.2.11 Necessary safety procedures / guidelines shall be followed during routine maintenance.

2.3 Data Management and Software Support Services (including software housekeeping)

This essentially includes

- (a) Continuous monitoring of the data and software performance at the field equipment, the communication system and the ATMS Control Centre system (e.g. Server) level to ensure data and software system stability at all times.
- (b) Immediate rectification of any problem and data recovery
- (c) Provide periodic housekeeping works on PC, Servers, Data, and Software related to the ATMS. They include inspection and update of related applications and operating system software.

2.4 Repair / Corrective Maintenance

This covers 24-Hours on site service to respond and rectify any fault on the ATMS reported by the Operations team or detected on own inspection, to meet the uptimes defined in the Service Level Requirements. The maintenance team will solve all issues and will provide corrective maintenance Services for all break down related to Data, PC, Servers, and Data Software Systems. The team will also manage all requests, questions, and enable off-site teams to trouble shoot via online links. The team will also support back and restore functions related to all ATMS equipment.

2.5 Roles of Members of the Maintenance Team**2.5.1. Maintenance Engineer**

The maintenance engineers will be normally engaged in routine maintenance activity as per the maintenance schedule. However as a top priority they will switch over to corrective services in case of receipt of complaints about equipment failure / malfunction. A timely and quality work on routine maintenance will normally reduce the need for corrective services.

2.5.2. IT / Database Administrator

The Database administrator is responsible for data management and software support services taking the support of maintenance engineers wherever required.

2.5.3. Maintenance Manager

The maintenance manager is responsible for meeting the maintenance service level requirements. Her / His role specifically includes

- 2.5.3.1. Monitoring the operational efficiency of the team with respect to meeting the service level requirements. This includes the analysis (based on system reports and direct observation) of the team's performance and determining the gaps for improvement.
- 2.5.3.2. Improving maintenance procedures (including the spares holding policy) based on the above analysis
- 2.5.3.3. Planning and implementing training programs for the team based on the above analysis.
- 2.5.3.4. Interacting with stakeholders along with the Operations team in evolving better maintenance practices, optimal maintenance schedules and contribute towards improvements in operations.

2.5.4. Traffic Manager

- 2.5.4.1. Play the role of the administrative head at site.



2.5.4.2. Evaluate the performance of the maintenance manager and support her / his initiatives on process improvements and training.

2.5.4.3. Reporting to the O&M top management on team performance.



Appendix D - Reporting requirements and Details Regarding Integration with Data Lake

1. Systems Registration

System	Chainage and Direction	Lat/Long	Additional Details #1	Additional Details #2
VID/VMS/TMCS/VA SD				

When SI registers each equipment on DataLake, a unique EQUIPMENTID will be generated for each and provided back to ATMS. All future reporting regarding those systems will contain the unique ID. In-case, the equipment is no longer active or the location has been changed then a new ID shall be generated for the equipment.

2. Camera Registration

EQUIPMENTID	Camera ID	Camera Public IP with Authentication Included	Type of Camera	Lane/Direction/
			Overview, ANPR, TMCS, Internal Command Centre	

System Registration and Camera Registration on Data Lake should be completed before the Go-Live of the Project and Sign-off.

3. Equipment System Uptime (100% System Generated)

EQUIPMENTID	Date	Uptime Minutes	Downtime Minutes	
			Overview, ANPR, TMCS, Internal Command Centre	

For Equipments with more than one Camera (VIDES), downtime of even single camera will be considered downtime for the equipment as a whole.

4. Automated Incident Log Report (Partly System Generated)

To assess the healthy functioning of key incident management activities.

Type of Incident	Detection Datetime	Source of Incident	Type of Vehicle	Number Plate	Action Taken
Based on Section ____		VIDES, TMCS or Manually Detected by Ground Team or Other	Identified through ATCC		RPV Dispatch, eChalan, None etc.

5. Vaahan Integration and Chalan Report

Incident ID	Incident Type	Datetime of Incident	Automatic/Manual	Chalan Forwarded Datetime	Number Plate of Vehicle
				Overview, ANPR, TMCS, Command Centre	

6. Emergency Call Report

Number of calls received from 1033 or Local Enforcement Agencies and Action Taken.

Datetime	Call Source (1033, Local etc)	Type of Incident	Time of Dispatch of Vehicle	Time of Reaching of Vehicle	Time for Resolution