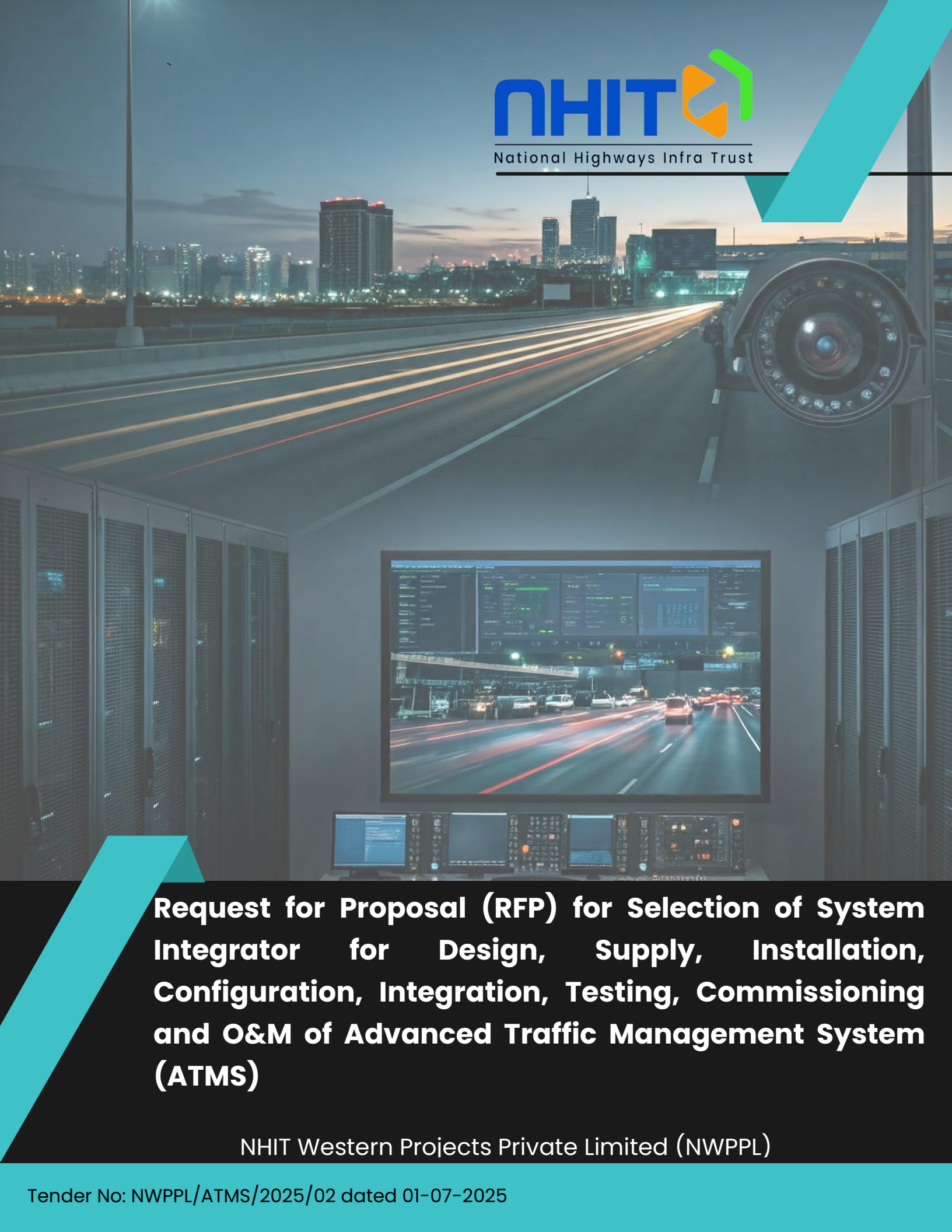




Request for Proposal (RFP) for Selection of System Integrator for Design, Supply, Installation, Configuration, Integration, Testing, Commissioning and O&M of Advanced Traffic Management System (ATMS)

NHIT Western Projects Private Limited (NWPPL)

Tender No: NWPPL/ATMS/2025/02 dated 01-07-2025

Disclaimer

The information contained in this Request for Proposal ("RFP") or subsequently provided to Bidder(s), whether verbally or in documentary or any other form by or on behalf of "NWPPL" by persons authorized to do so, is provided to the interested parties on the terms and conditions set out in this RFP and such other terms and conditions subject to which such information is provided.

This RFP is not an agreement and is neither an offer nor an invitation by NWPPL to interested parties who submit their quote (henceforth "Bidders") in response to this RFP. The purpose of this RFP is to provide Bidders with information that may be useful to them in preparing and submitting their bids for **Request for Proposal (RFP) for Selection of System Integrator for Design, Supply, Installation, Configuration, Integration, Testing, Commissioning and O&M of Advanced Traffic Management System (ATMS)**

NWPPL makes no representation or warranty and shall have no liability to any person 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 or otherwise, including the accuracy, adequacy, correctness, completeness or reliability of the RFP and any assessment, assumption, statement or information contained herein or deemed to form part of this RFP or arising in any way from this process.

A Bidder must warrant that all the information provided by it to NWPPL at the time of Tender & subsequently, is true to the best of its knowledge & belief, and specially warrants that it has duly complied with the provisions of laws applicable to it. Bidder indemnifies NWPPL from any liabilities arising out of error or default or negligence or contravention in regard to any of the applicable laws, including, but not limited to, submission of statutory forms & other such documents.

The issue of this RFP does not imply that NWPPL is bound to select any Bidder(s) for any project/ work/ services / transaction. NWPPL may accept or reject any proposal in its discretion and may ask for any additional information or vary its requirements, add to or amend the terms, procedure and protocol set out in RFP for bona fide reasons, which will be notified to all the Bidders invited to tender. Further NWPPL hereby reserves the right to annul the process at any time prior to issuance of the Letter of Award/PO/WO without incurring any liability towards the Bidders.

The Bidders shall bear all costs associated with or relating to the preparation and submission of its Proposal including but not limited to preparation, copying, postage, delivery fees, expenses associated with any demonstrations or presentations which may be required by NWPPL, or any other costs incurred regarding or relating to its Bid. All such costs and expenses will remain with the Bidder and NWPPL shall not be liable in any manner for the same or for any other costs or expenses incurred by a Bidders in preparation or submission.

Table of Contents

ABBREVIATIONS	11
PART-I: BIDDING PROCEDURE.....	14
1 NOTICE INVITING TENDER	15
1.1 General Notice to All Bidders	15
1.2 Schedule Of Important Events / Activities.....	20
2 INSTRUCTIONS TO THE BIDDERS	21
2.1 Tender Document Fee, Bid Security And General Terms Of Bidding	21
2.2 Eligibility Criteria/Prequalification Criteria (PQ).....	23
2.3 Technical Qualifications.....	28
2.4 Additional Qualifications	34
2.5 Manufacturing Authorization:	36
2.6 Accessing RFP Documents, Preparation and Submission of BID	37
2.7 Bid Composition:	37
2.8 Bid Submission:.....	41
2.9 Bid Validity.....	43
2.10 Modification/Substitution/Withdrawal of Bids	44
2.11 Amendment to RFP Documents:	44
2.12 Cost of Bidding.....	45
2.13 Language of the Bids	45
2.14 Opening & Evaluation of Bids	45
2.15 Award Criteria.....	49
2.16 Imbalanced Bid:	50
2.17 Letter of Award.....	51
2.18 Performance Security	51
2.19 Indemnity.....	51
2.20 Proprietary Data	52
2.21 Right to Amend Scope	52
2.22 Right to Vary quantity:.....	52
2.23 Conflict of Interest:.....	53
2.24 Miscellaneous.....	57

PART-II: TERMS OF REFERENCE	60
3 GENERAL REQUIREMENTS FOR THE ATMS.....	61
3.1 Overview of ATMS Solution.....	62
3.2 Submittals.....	63
3.3 Quality Assurance	63
3.4 Remote Access during the Contract period.....	64
3.5 Power Supply & Communications	65
4 SCOPE OF WORK	69
4.1 Geographical Scope	69
4.2 Existing Components Scope	72
4.3 Turnkey Implementation:.....	73
4.4 Equipment site plan / Indicative Equipment Location	73
4.5 Site Survey for ATMS Implementation	73
4.6 Conducting the FAT:	76
4.7 Material Supply:	76
4.8 Material Delivery Verification:	76
4.9 Site Components Installation	77
4.10 Setup of Traffic Management Center (Control Center) for ATMS:.....	80
4.11 Optical Fiber Cable (OFC) based Digital Communication System.....	82
4.12 Installation Acceptance Test.....	84
4.13 Go Live and System Commissioning	84
4.14 System Acceptance Test	84
4.15 Defects Liability Period (DLP)	84
4.16 Operation & Maintenance.....	85
4.17 Scope Relevance	85
4.18 Scope Matrix.....	86
5 ATMS DESIGN	97
5.1 ATMS -Detailed Design	97
5.2 Design Review and Approval	107
5.3 Sub-Center Component Project	108
6 FUNCTIONAL REQUIREMENTS OF ATMS	113

6.1	Traffic Monitor Camera System (TMCS)	113
6.2	Video Based Incident Detection and Enforcement Systems (VIDES)	117
6.3	Vehicle Actuated Speed Display	131
6.4	Variable Message Sign (VMS)	133
6.5	ATMS Control Centre with ATMS Software	136
6.6	Optical Fiber Cable (OFC) based Digital Communication System.....	164
6.7	Emergency Roadside Telephone System (ERTS) or Emergency Call Box (ECB)	169
6.8	Mobile Radio Communication System (MRCS)	171
7	TECHNICAL SPECIFICATION OF ATMS	174
7.2	Technical Specifications of VIDES	177
7.3	Technical Specification of VASD	182
7.4	Technical Specifications of VMS	185
7.5	Technical Specification for OFC based digital Communication System	190
7.6	Technical Specification of Control Room Equipment	191
7.7	Technical Specification of MRCS.....	224
7.8	Technical Specification of Emergency Roadside Telephone System.....	230
8	SYSTEM TESTING AND ACCEPTANCE	232
8.1	General Testing.....	232
8.2	Factory Acceptance Test:.....	234
8.3	Installation Acceptance Test.....	236
8.4	System Acceptance Test	238
9	SERVICE LEVEL AGREEMENT & SPARE PARTS	240
9.1	Service Level Agreements (SLA)	240
9.2	Spare Parts.....	250
10	OPERATION AND MAINTENANCE (O&M)	253
10.1	O&M Requirements for ATMS.....	253
10.2	Manpower detail & responsibility	254
10.3	Maintenance	255
11	ATMS TRAINING	259
11.1	General	259
11.2	Management and Operations Training	260

11.3	Maintenance Training.....	261
11.4	Software Training	262
11.5	Hardware Training	262
12	INFORMATION SECURITY & SAFETY.....	264
12.1	Information Security and Data Protection.....	264
12.2	Equipment Security	264
12.3	Civil Design	265
12.4	Work Area Safety and Traffic Control	265
12.5	NWPPL/NEPPL Standard Operating Procedure “Safety Measures for Working on Live Road”	267
13	TIMELINES AND PAYMENT MILESTONE	275
13.1	Timelines for ATMS System	275
13.2	Payment Milestone	276
14	ATMS IN DISASTER MANAGEMENT	282
14.1	Introduction.....	282
14.2	Disaster management framework in India	283
14.3	Phases in Disaster Management	283
14.4	Highway management role in Disaster Management framework	284
14.5	Enhancement of ATMS for Disaster Management.....	286
15	REPORTING AND INTEGRATION WITH DATA LAKE AND OTHERS.....	287
15.1	Systems Registration	287
15.2	Camera Registration	287
15.3	Equipment System Uptime (100% System Generated).....	288
15.4	Automated Incident Log Report (Partly System Generated).....	288
15.5	Vaahan Integration and Challan Report	288
15.6	Emergency Call Report	289
15.7	Any Other Integration.....	289
BID SUBMISISON FORMS.....		290
	Form T-1: Technical Bid Covering Letter	291
	Form T-2: Brief Information about the Bidder.....	295
	Form T-3 Bidder’s Average Annual Turnover and Net Worth Certificate	297

Form T-4: Work Experience/Credentials of Bidder.....	298
Form T-5: Self-Certification on Proprietary ATMS Application.....	301
Form T-6 Certification on Number of Employees.	304
Form T-7: Affidavit on Litigation / Arbitration History	305
Form T-8: Make and Model List (Unpriced BoM)	307
Form T-9: Manufacturer's Authorization Form (MAF).....	321
Form T-10 Proposed Personnel	325
Form T-11 Resume of Key Personnel	326
Form T-12 Approach & Methodology	332
Form T-13 Bidder Recommended Spare parts.....	338
Form T-14 Integrity Pact Format.....	339
Form T-15 Power of Attorney	346
Form T-16 Bank Guarantee Format	349
Form T-17 Performa for Pre-Bid Queries.....	354
Form F-1 Format for Financial Bid Submission	355
PART-III: Conditions of the Contract	356
DRAFT CONTRACT AGREEMENT	357
SCHEDULE-A : GENERAL CONDITIONS OF CONTRACT (GCC)	361
1 PURPOSE AND APPLICABILITY OF THE GENERAL CONDITIONS OF CONTRACT (GCC).....	362
1.1 Objective and Enforceability	362
1.2 Scope and Applicability.....	362
1.3 Precedence and Interpretation	363
2 General Provisions	363
2.1 Definitions	363
2.2 Interpretation	399
2.3 Governing Law & Jurisdiction	400
2.4 Language of the Contract	400
2.5 Communications & Notices	401
2.6 Priority of Documents.....	401
3 Scope of Contract.....	403

3.1	Description of Work.....	403
3.2	Obligations of the Contractor (System Integrator)	403
3.3	Obligations of the Employer	406
3.4	Subcontracting & Third-Party Vendors.....	407
3.5	Standards & Specifications	411
3.6	Compliance with Regulatory & Statutory Requirements	419
4	Performance Security & Guarantees	422
4.1	Performance Security Deposit (PBG).....	422
5	Project Implementation & Execution.....	425
5.1	Project Milestones & Timelines	425
5.2	Deployment of Personnel & Resources.....	427
5.3	Testing, Commissioning & Go-Live	428
5.4	Training & Knowledge Transfer	430
5.5	Site Access & Work Permits.....	431
5.6	Approval Process and Timeline Commitment	433
6	Payment Terms & Invoicing	436
6.1	Contract Price & Currency	436
6.2	Payment Schedule & Milestones.....	436
6.3	Taxes, Duties & Statutory Levies	438
6.4	Deductions & Withholdings.....	439
6.5	Late Payment & Interest Charges.....	440
6.6	Submission of Documentation Along with Invoice.....	441
7	Change Management & Variations.....	445
7.1	Changes in Scope & Additional Work	445
7.2	Cost & Time Implications of Change.....	446
7.3	Procedure for Approval of Changes	449
7.4	Claims & Compensation for Changes	451
8	Performance, SLA & Penalties	453
8.1	Key Performance Indicators (KPIs)	453
8.2	Service Availability & Uptime Guarantees.....	455
8.3	Monitoring & Reporting Requirements.....	456

8.4	Failure to Meet SLAs & Penalties.....	459
8.5	Liquidated Damages (LD), SLA Penalties & Liability Cap	460
8.6	Liquidated Damages (LD) for Delays.....	462
9	Intellectual Property, Data & Cybersecurity	466
9.1	Ownership of Software & Deliverables	466
9.2	Use of Proprietary & Open-Source Software	467
9.3	Confidentiality & Non-Disclosure	467
9.4	Data Protection & Privacy Compliance.....	467
9.5	Cybersecurity & Data Breach Handling	468
9.6	Software Updates, Version Control & Audits	468
9.7	Compliance Monitoring & Reporting	469
10	Risk Allocation, Liabilities & Insurance	470
10.1	Indemnification by the Contractor	470
10.2	Insurance Requirements (Contractor's All Risk, Third Party, etc.)	472
10.3	Health, Safety & Environmental Compliance	475
11	O&M & Lifecycle Management	478
11.1	Operation & Maintenance (O&M) Requirements.....	478
11.2	Post-Implementation Support & Operation & Maintenance (O&M).....	481
11.3	Spare Parts & Consumables Management.....	485
11.4	End-of-Life & System Upgradation	487
12	Future-Proofing & Technological Compliance	491
12.1	Scalability & Expandability of the ATMS System	491
12.2	Compliance with Emerging Technologies & Standards.....	494
12.3	Upgrade & Enhancement Policies	497
13	Compliance, Audits & Safety	502
13.1	Audit Rights & Compliance with Laws	502
13.2	Workplace Safety & Occupational Hazards	504
13.3	Anti-Corruption & Ethical Practices.....	507
14	Force Majeure.....	510
14.1	Definition of Force Majeure	510
14.2	Procedure for Notification.....	511

14.3	Consequences & Remedies	511
15	Contract Suspension & Termination	513
15.1	Suspension of Work.....	513
15.2	Termination for Default.....	514
15.3	Termination for Convenience.....	516
16	Dispute Resolution Mechanism.....	522
16.1	Dispute Notification and Attempt at Amicable Settlement	522
16.2	Internal Dispute Resolution Board (IDRB)	522
16.3	Mediation	523
16.4	Reference to SAROD Arbitration	523
16.5	Governing Law and Jurisdiction.....	524
16.6	No Suspension of Work	524
16.7	Interim Relief	524
17	Miscellaneous Provisions	526
17.1	Assignment & Novation.....	526
17.2	Conflict of Interest	527
17.3	Severability of Contract	529
17.4	Exit Management & Handover	530
17.5	General Compliance	532
17.6	Interpretation of Contract	534
17.7	Confidentiality & Intellectual Property Rights.....	535
17.8	Third-Party Rights	537
17.9	Force of Documentation.....	538
17.10	Provisions for Emergencies	540
17.11	Waiver.....	541
17.12	Entirety of Agreement	542
17.13	Survival of Terms	543
17.14	Acknowledgment.....	544
17.15	Language of the Contract	544
	Schedule-B Terms of Reference.....	545

ABBREVIATIONS

Acronym	Definition
AI/ML	Artificial Intelligence/Machine Learning
API	Application Programming Interface
APTS	Automatic Power Transfer Switch
ATCC	Automatic Traffic Counter and Classifier
ATMS	Advanced Traffic Management System
ATS	Automatic Transfer Switch
BIS	Bureau of Indian Standards
CCTV	Closed Circuit Television
CIF	Common Intermediate Format
CMOS	Complementary Metal-Oxide-Semiconductor
DC Power	Direct Current Power
DEG/DG	Diesel Engine Generator
DLP	Defects Liability period
DM	Disaster Management
ECB	Emergency Call Box
ERT	Emergency Roadside Telephone
ETC	Electronic Toll Collection
FAT	Factory Acceptance Tests
FPS	Frames Per Second
FTP	File Transfer Protocol
GPRS	General Packet Radio Service
GSM	Global System for Mobile Communications
GUI	Graphical User Interface
HD	High-definition
HDPE	High-density polyethylene
HTTP	Hypertext Transfer Protocol
HVAC	Heating, Ventilation and Air conditioning
IC	Interchange

IC Card	Integrated Circuit Card (ICC)
IHMCL	Indian Highway Management Company Limited
IMS	Incident Monitoring System
IP	Internet Protocol
IP-PBX	Internet Protocol – Private Branch Exchange
IRC	Indian Roads Congress
ISO	International Organization for Standardization
IT	Information Technology
ITS	Intelligent Transportation System
ITU-T	Telecommunication Standardization Sector of the International Telecommunication Union
JPEG	Joint Photographic Experts Group
LAN	Local Area Network
MoRTH	Ministry of Road Transport and Highway
MPEG	Moving Picture Experts Group
MTBF	Mean Time Between Failures
MTTR	Mean Time To Repair
NAS	Network Attached Storage
NDMA	National Disaster Management Authority
NDRF	National Disaster Response Force
NH	National Highway
NHAI	National Highways Authority of India
NHIPMPL	National Highways InvIT Project Managers Private Limited
NHIT	National Highways Infra Trust
NMS	Network Management System
NVR	Network Video Recorder
NWPPL	NHIT Western Projects Pvt Ltd.
NEPPL	NHIT Eastern Projects Pvt Ltd.
NSPPL	NHIT Southern Projects Pvt Ltd
O&M	Operation and Maintenance
OFC	Optical Fibre Cable
ONVIF	Open Network Video Interface Forum

P2P	Point – to – Point Protocol
PCU	Passenger Car Unit
PDB	Power Distribution Board
PIU	Project Implementation Unit
PMU	Project Management Unit
PQ	Prequalification
PTZ	Pan, Tilt, and Zoom (function)
QCIF	Quarter Common Intermediate Format
RAID	Redundant Array of Inexpensive Disks
RFP	Request for Proposal
SAT	System Acceptance Tests
SD	Standard-definition
SDMA	State Disaster Management Authority
SIM	Subscriber Identity Module
SNMP	Simple Network Management Protocol
SNTP	Simple Network Time Protocol
Solar PV	Solar Photo Voltaic
TCIL	Telecommunications Engineering centre of the Government of India
TCP	Transmission Control Protocol
TMC	Traffic Management Centre
TMCS	Traffic Monitor Camera System
TMS	Toll Management System
TOR	Terms of Reference
UDP	User Datagram Protocol
UPS	Uninterruptible Power Supply
VASD	Vehicle Actuated Speed Display
VIDES	Video Incident Detection & Enforcement System
VMS	Variable Message Signs
VoIP	Voice over IP
VSDS	Vehicle Speed Detection System
WAN	Wide Area Network

PART-I: BIDDING PROCEDURE

1 NOTICE INVITING TENDER

1.1 General Notice to All Bidders

- 1.1.1 National Highways Infra Trust was set up by National Highways Authority of India (NHAI) on 19th October 2020, as an irrevocable infrastructure trust under the provisions of the Indian Trusts Act, 1882. The Trust was registered as an Infrastructure Investment Trust on 28th October 2020, under the Securities and Exchange Board of India (Infrastructure Investment Trusts) Regulations, 2014 ("SEBI InvIT Regulations") having registration number IN/InvIT/20-21/0014. The Investment objectives of the Trust are to carry on the activities of, and to make investments, as an Infrastructure Investment Trust, as permissible in terms of the applicable law.
- 1.1.2 NHIT Western Projects Private Limited ("NWPPL") is a Private Limited Company incorporated on April 19, 2023, under the Companies Act, 2013 and as a Special Purpose Vehicle ("SPV") of National Highways Infra Trust ("NHIT").
- 1.1.3 NHIT Eastern Projects Private Limited ("NEPPL") is a Private Limited Company incorporated on April 19, 2023, under the Companies Act, 2013 and as a Special Purpose Vehicle ("SPV") of National Highways Infra Trust ("NHIT").
- 1.1.4 NHIT Western Projects Private Limited ("NWPPL") is tender inviting authority (Hereinafter referred to as "NWPPL" or "Client" or "Authority") for all the projects, **however it is to note that** while NWPPL manages the tendering, the actual awarding of work and the signing of the definitive contract will be executed by a distinct, responsible Special Purpose Vehicle (SPV), as detailed in the below table :

Sl#	Package	Project Name	Project Length	Control Centre	Responsible SPV
1	Pkg-01	Kaljhar-Patacharkuchi Project Highway of National Highway - 27 commencing from km 1013+000 of NH-27 at Kaljhar and ends at km 1040+300 at Pattacharkuchi in the state of Assam	27.3 KM	Control Centre- 01	NEPPL
		Lakhnadon-Mahagaon(Mohgaon)-Khawasa Project Highway Stretch starts from Km 546+420 and ends at Km 653+770 km on NH-44 (old NH-7) in the State of Madhya-Pradesh	107.35 KM	Control Centre- 01	
2	Pkg-02	Chittorgarh-Kota Project Highway Stretch starts from km 891+929 at Chittorgarh Bypass and ends at km 1052+429 at Kota on NH-27 in the State of Rajasthan	160.5 KM	Control Centre- 01 Sub Center-01	NWPPL
3	Pkg-03	Borkhedi-Wadner-Deodhari-Kelapur-Maharashtra/Telangana Border Start point of the Project stretch is near Borkhedi village in Maharashtra at existing km 36+600 and end point is at existing km 175+000 before the approach of major bridge on Penganga River at Maharashtra-Telangana border	138.4 KM	Control Centre- 01 Sub Center-01	NWPPL

- 1.1.5 Bidders may submit bids for one, multiple, or all packages. However, a bidder shall be awarded a maximum of **one package**.
- 1.1.6 The project shall be on a completely turnkey-based solution with provision of skilled resources for Request for Proposal (RFP) for Selection of System Integrator for Design, Supply, Installation, Configuration, Integration, Testing, Commissioning and O&M of Advanced Traffic Management System (ATMS). The project duration for implementation and commissioning shall **be 8 months**. The defect liability period is 1 year, and the Operations & Maintenance (O&M) period is 4 years. Accordingly, the overall period covering implementation, commissioning, defect liability, and O&M is five (5) years and 8 months.
- 1.1.7 Additionally, the O&M period may be extended annually for up to two years according to the terms and conditions specified in the RFP.
- 1.1.8 The prospective bidders are hereby invited to submit their bids comprising Technical and Financial formats by the bid due date and time. Bid shall be valid for a period of **120 days** w.e.f. bid due date.
- 1.1.9 The selection of the successful bidder shall be based on the **L-1 method** (Least Cost System), as detailed in this RFP.
- 1.1.10 Bidders must pay a non-refundable Tender Document Fee of INR 25,000/- plus 18% GST (INR 4,500/-), totalling **INR 29,500/-** (Rupees Twenty-Nine Thousand Five Hundred Only) online.
- 1.1.11 The Bidder shall also submit the online payment receipt along with bid document. Details of designated bank account are as under:

Sr	Particular	Details
1	Name of Beneficiary	NHIT Western Projects Private Limited
2	Name of Bank	State Bank of India (SBI)
3	Account No.	40797007409
4	IFS Code	SBIN0017313

- 1.1.12 Bid Security (Refundable) of **INR 15,00,000/- (Rupees Fifteen Lakh only)** in the form of a **bank guarantee** issued by any nationalized bank, or a Scheduled Bank in India. The bid security shall be in favor of NWPPL in the format given in this RFP and having a validity period of not less than 180 (one hundred eighty) days from the Bid Due Date, having an additional claim period of 60 (sixty) days, and may be extended mutually agreed between the NWPPL and the bidder from time to time.
- 1.1.13 NWPPL has adopted a two-stage bidding process for selection of the preferred bidder, as: "Technical Bid" containing all technical proposal and the "Financial Bid" containing amount quoted by the Bidder. The bid document shall be submitted in **physical form** in the prescribed format in the manner specified, before the date and time specified herein.
- 1.1.14 The bid security of the successful bidder shall be released after providing a performance bank guarantee. The bid security of all other bidders may be released within 30 days of selection of the preferred bidder.
- 1.1.15 Any bid not accompanied by an acceptable Tender Document Fee and Bid Security or EMD in the prescribed manner shall be summarily rejected.
- 1.1.16 No Bidder shall be allowed to submit more than one Bid for the Project.
- 1.1.17 Conditional Bids shall be rejected.
- 1.1.18 The Bidding documents provided by the NWPPL are property of the client and are transmitted to the Bidders solely for the purpose of preparation and submission of Bids in accordance herewith. Bidders shall treat all such information strictly confidential and shall not use it for any other purpose except for preparation and submission of their Bids. The provisions of this Clause shall also apply mutatis mutandis to Bids and other documents submitted by the Bidders. Anyhow NWPPL will not return any Bid, document or any other information provided by the bidder except the financial bids of technically disqualified bidders.

- 1.1.19 Only those Bidders whose Technical Bids are found to be responsive and meeting the Minimum Eligibility Criteria (hereinafter referred to as “Technically Qualified Bidders”) in terms of this RFP, shall be invited to participate for the opening of their Financial Bids.
- 1.1.20 The Technically Qualified Bidders may send their authorized representatives along with an authorization letter on the letterhead of the bidder for participation in the opening of the Financial Bid. The date and time of opening of Financial Bids of such Technically Qualified Bidders, shall be informed to them separately through email or uploaded on the NHIT website. The Financial Bids will be opened physically at the location provided in such communications. Only one representative of the Technically Qualified Bidders shall be allowed to attend the opening of the Financial Bids.
- 1.1.21 Bidders are advised to submit their respective Bid after visiting the Project site and ascertaining for themselves the site conditions, traffic, location, surroundings, climate, availability of power, water, utilities for construction, access to site, storage of materials, applicable laws & regulations, and any other matter considered relevant by them. The costs of visiting the site(s) shall be at the Bidder’s own expense.
- 1.1.22 At the time of bid submission, the Bidder is expected to have examined the site(s) and obtained all necessary information at their own responsibility and risk for preparing the bid and entering into the Contract.
- 1.1.23 Any bidder interested in carrying out a site visit may write to NWPPL. On receipt of request, NWPPL shall issue an Authorization letter for site visit to such bidder(s).
- 1.1.24 The Technical Bid shall be evaluated for all bidders in line with the provisions of the RFP. The Financial Bid of only technically qualified bidders shall be opened and further evaluated in line with the RFP provisions.

1.2 Schedule Of Important Events / Activities

Sl. No.	Event Description	Schedule (Unless otherwise notified separately)
1	Invitation of RFP (NIT)	01-07-2025
2	Last date for receipt of pre-bid queries	07-07-2025
3	Pre-Bid meeting at NWPPL office	08-07-2025 at (11:30 Hrs)
4	NWPPL response to queries latest by	10-07-2025
5	Bid Due Date (Last date of bid submission)	25-07-2025 at (17:00 Hrs)
6	Opening of Technical BIDs at venue	25-07-2025 at (18.00 Hrs)
7	Opening of Financial BID	to be notified separately to technically qualified bidders.

- 1.2.1 Any queries or request for additional information concerning the RFP shall be submitted through e-mail along with soft copy (editable) to the officer designated below on or before the date as per RFP. No query received after fixed date and time shall be entertained. The email communication shall clearly bear the following identification/title:

“Queries/Request for Additional Information: ATMS RFP issued by NWPPL for Tender No: NWPPL/ATMS/2025/02 dated 01-07-2025”

[Arun Kumar Jha]
(Head SPV)

Authorized Signatory
NHIT Western Projects Private Limited (NWPPL)
Unit No.: 324, 3rd Floor, D21 – Corporate Park,
Sector-21, Dwarka, Delhi:110077, India.
E mail: procurement@nhit.co.in

2 INSTRUCTIONS TO THE BIDDERS

2.1 Tender Document Fee, Bid Security And General Terms Of Bidding

- 2.1.1 Bidders must pay a non-refundable Tender Document Fee of INR 25,000/- plus 18% GST (INR 4,500/-), totalling **INR 29,500/-** (Rupees Twenty-Nine Thousand Five Hundred Only) online.
- 2.1.2 Bid Security (Refundable) of **INR 15,00,000/-** (Rupees Fifteen Lakh only) in the form of a **bank guarantee** issued by any nationalized bank, or a Scheduled Bank in India. The Bid security shall be in favor of NWPPL in the format given in this RFP and having a validity period of not less than 180 (one hundred eighty) days from the Bid Due Date, with an additional claim period of 60 (sixty) days, and may be extended mutually agreed between the NWPPL and the bidder from time to time.
- 2.1.3 The security of the successful bidder will be released after providing a performance bank guarantee (PBG). The bid security of all other bidders may be released within 30 days of selecting the preferred bidder.
- 2.1.4 Any bid not accompanied by an acceptable Tender Document Fee and Bid Security shall be summarily rejected.
- 2.1.5 No Bidder shall submit more than one Bid for the Project.
- 2.1.6 Conditional Bids shall be rejected.
- 2.1.7 The Bidding documents provided by the NWPPL is property of the client and are transmitted to the Bidders solely for the purpose of preparation and submission of Bids in accordance herewith. Bidders shall treat all such information strictly confidential and shall not use it for any other purpose except for preparation and submission of their Bids. The provisions of this Clause shall also apply *mutatis mutandis* to Bids and other documents submitted by the Bidders. Anyhow NWPPL will not return any Bid, document or any other information provided by the bidder.

- 2.1.8 NWPPL has adopted a two-stage bidding process for selection of the preferred bidder as: “**Technical Bid**” containing all technical proposal and the “**Financial Bid**” containing amount quoted by the Bidder. The bid document shall be submitted in **physical form** in the prescribed format in the manner specified, before the date and time specified herein.
- 2.1.9 The financial bid will be divided **into three(3) separate packages**. Bidders may submit financial bid(s) for one, multiple, or all packages. However, a bidder will be awarded a maximum **of one package**.
- 2.1.10 Bidder shall be selected under Lowest-1 (L1) Method as described in this RFP and in accordance with the procedure mentioned in this RFP.
- 2.1.11 The bidder shall nominate an authorized signatory from the firm. The nomination(s) shall be supported by a Power of Attorney duly signed by competent authority of the firm. Such authorized signatory shall be a Director/ Partner/ Office bearer of the entity, and his/ her power to sign documents for and on behalf of the entity shall be illustrated by a copy of the Board resolution/ general Body meeting that authorizes him or her to do so, duly attested by the Company Secretary or such other signatory recognized in law.

2.2 Eligibility Criteria/Prequalification Criteria (PQ)

Only bidders who fulfill all pre-qualifications listed in the table shall be eligible to submit the bid:

S. No	Eligibility Criteria /Conditions	Supporting Document Evidence
PQ 1 – Legal Entity	The Bidder must be a business entity incorporated in India under the Companies Act,1956/2013 or a partnership firm confirming to the Limited Liability Partnerships Act, 2008. Joint ventures or Consortiums are NOT permitted to participate in this bid.	Form T-2: Brief Information about the Bidder along with the following supporting documents: Copy of Certificate of Incorporation / Registration /Copy of registered Partnership deed, as applicable.
PQ 2 – Annual Turnover	The Bidder shall have a Minimum Average Annual Turnover of INR 40 Crore or more during any consecutive 03 (three) financial years among, i.e., 2021-22, 2022-23, 2023-24, 2024-25	Form T-3 Bidder's Average Annual Turnover and Net Worth Certificate Signed by Statutory Auditor clearly specifying the annual turnover for the specified years.
PQ 3 – Net worth	The Bidder shall have Net worth of INR 1 Crore or more as of 31 March 2024 or (31 March 2025, as applicable)	As per PQ-2 above.

S. No	Eligibility Criteria /Conditions	Supporting Document Evidence
PQ – 4 Relevant Field of Business	The Bidder shall have operating history in the field of ATMS/HTMS for at least five (5) years, as on bid due date.	Form T-1: Technical Bid Covering Letter (Undertaking is part of the form)
PQ 5 – Relevant Experience	Bidders must have awarded, implemented and commissioned ATMS/HTMS projects of 200 KMs (Cumulative Length of Qualifying Projects) within 10 years from bid due date, which includes Design, Supply, Installation, Configuration, Integration, Testing, Commissioning, Operation and Maintenance with conditions as mentioned below: A. Bidder must have at least one single Qualifying project with length of at least 50 Kms or more <u>Definition of Qualifying Projects:</u> A qualifying Project should be a National or State highway/expressway project and mandatorily include a dedicated Command	Form T-4: Work Experience/Credentials of Bidder Along with Form T-4A and Following supporting documents: Work order(s)/ Contract Agreement(s) clearly highlighting the relevant scope of work, and contract value, year of execution. AND SAT Certificate/ Completion Certificate signed by AE/IE or authorized representative of Client.

S. No	Eligibility Criteria /Conditions	Supporting Document Evidence
	Control center, along with at least any 05 (Five) of the following sub-systems/ components: 1. Traffic Monitoring Camera System (TMCS) / PTZ Cameras based Traffic Surveillance System 2. Vehicle Speed Detection System (VSDS)/ Vehicle Actuated Speed Display (VASD) /Radar or ANPR Camera-based speed detection/congestion estimation/speed-display solution. 3. Video Incident Detection System (VIDS)/ Video Incident Detection and Enforcement System (VIDES)/ Video Analytics based solutions to detect traffic anomalies and violations. 4. Incident Enforcement System with integration with VAHAN/NIC for e-challan 5. Variable Message Sign Board System 6. Emergency Call Box	AND Form T4B Current performance certificate: For Projects that have completed implementation phase and currently under Operation & Maintenance (O&M) period, must provide a current performance certificate issued by the Authority/Client. Note: (a) Bidder must provide the Form T4A containing the summary of all projects. (b) NWPPL reserves the right to contact the competent authorities of claimed projects, for the verification of credentials.

S. No	Eligibility Criteria /Conditions	Supporting Document Evidence
	(ECB) 7. OFC Based Digital Communication Systems. c) Any completed project wherein penalty/Liquidated Damages (LD) has been levied by the client on completion of the project shall not be considered as a qualifying project. Note- Experience of Civil Contractors/Concessionaires who have executed the HTMS/ATMS Works through System Integrators shall NOT be considered.	
PQ 6 – Proprietary Applications Software of ATMS	The bidder should demonstrate ownership/proprietary rights of ATMS software it proposes to deploy with a proven track record of integration with the required ATMS subsystems and minimum operating life of three (3) years or more prior to the bid due date.	Form T-5: Self Certification on Proprietary ATMS Application Documentary evidence shall be submitted along with the bid confirming the ownership and the operational period of at least Three (03) years or more. <i>NWPPL reserves the right to</i>

S. No	Eligibility Criteria /Conditions	Supporting Document Evidence
		<i>contact the competent authorities of projects where solution has been deployed, for the verification of credentials.</i>
PQ 7 Certification	The Bidder Must have the following certifications, as on bid due date: 1. CMMi Level 3 or above 2. ISO 27001:2013 for Information Security Management System	Valid Scan copy of the relevant certificate(s).
PQ 8 - Undertaking of Blacklisting	The Bidder should NOT be under period of Suspension / Debarment / blacklisting by Ministry of Road Transport & Highways / NHAI /IHMCL /NHIDCL/NHIT (including all entities under NHIT)/State Government Department /Authorities as on bid due date.	Form T-1: Technical Bid Covering Letter <i>(Undertaking is part of the form)</i>
PQ 9 - Undertaking of Insolvency, bankruptcy	Bidder(s) shall be ineligible to participate if they have been subject to NCLT/Court proceedings for insolvency or bankruptcy; OR terminated from ATMS project; within last 05 years prior bid due date by the Ministry of Road Transport & Highways , its executing agencies (IHMCL, NHAI, NHIDCL), or any other Ministry, PSU, State or Central Government department, enforcement agency, NHIT, NWPPL, NEPPL or autonomous body.	Form T-1: Technical Bid Covering Letter <i>(Undertaking is part of the form)</i>

2.3 Technical Qualifications

Technical qualifications shall be evaluated for bidders meeting the pre-qualification criteria mentioned under clause 2.2.

A Bidder must achieve the minimum qualifying score in the technical evaluation to be declared technically qualified.

2.3.1 Score Summary

SI#	Technical Evaluation Criteria	Max Marks
A	Bidder Profile:	20
A1	Turnover	10
A2	Manpower Strength	5
A3	Experience of the bidder	5
B	Relevant Project Experience	50
B1	ATMS/HTMS Project Experience	15
B2	Specific Experience in PTZ/TMCS Implementations	10
B3	Specific Experience in VSIDS/ VASD –Radar/ANPR Camera-based speed detection/display solution	10
B4	Specific Experience in VIDS or VIDES	10
B5	ATMS/HTMS Integration with e-Challan (NIC)	5
C	Approach & Methodology and Demonstration	30
C1	Detailed Approach & Methodology	10
C2	Demonstration of ATMS Software	20

2.3.2 Detailed Score table

S. No	Technical Evaluation Criteria	Max Marks	Supporting Documents to Be Provided
A	Bidder Profile:	20	
A1	Turnover Average annual turnover of the Bidder during any consecutive three (03) financial years, within the period of FY 2021- 22, 2022-23, 2023-24 and 2024-25 Marks shall be allotted as given below: • Equal to or greater than INR 100 crores = 10 marks • Equal to or greater than INR 80 crores but less than INR 100 Crore = 9 marks • Equal to or greater than INR 60 crores but less than INR 80 Crore = 8 marks • Equal to or greater than INR 40 crores but less than INR 60 Crore = 7 marks • Less than INR 40 crores = 0 Marks	10	As per PQ 2 – Annual Turnover under clause 2.2
A2	Manpower Strength – Average number of full-time employees on the pay-roll of the Bidder during past six months from bid due date. Marks shall be allotted as given below: • Equal to or greater than 100 employees = 5 marks • Equal to or greater than 75 employees but less than 100 employees = 4 marks	05	Form T-6 Certification on Number of Employees. AND EPFO Challan of last 06 months.

	- Equal to or greater than 50 employees but less than 75 employees = 3 marks - Less than 50 employees = 0 Marks Note: - Only full-time employees of the bidder's entity, as verified by EPFO Challans, shall be considered for this criterion.		
A3	Experience of the bidder The Experience of Bidder based on the registration date of entity. - Experience is 10 years or more: 5 Marks - Experience is 8 years or more but less than 10 years = 4 Marks - Experience is 5 years or more but less than 8 years = 3 Marks - Less than 5 Years= 0 Marks	05	As per PQ 1 – Legal Entity under clause 2.2
B	Relevant Project Experience	50	
B1	ATMS/HTMS Project Experience Cumulative length of Qualifying ATMS/HTMS project on State Highways/Expressways or National Highways /Expressways inline to the requirement prescribed under PQ-05 of Clause 2.2 - Each 100 KM of Qualifying Project : 03 marks >=200 KM = 6 marks >= 300 KM=9 Marks	15	As per PQ 5 – Relevant Experience under clause 2.2.

	• ≥ 400 KMs = 12Marks • ≥ 500 KMs = 15 Marks		
B2	Specific Experience in PTZ/TMCS Implementations: Total quantity of PTZ/TMCS Cameras supplied and installed by bidder on Qualifying ATMS/ HTMS projects: • 301 and above TMCS/PTZ cameras= 10 Marks • 251 to 300 TMCS/PTZ Cameras = 9 Marks • 201 to 250 TMCS/PTZ Cameras = 8 Marks • 151 to 200 TMCS/PTZ Cameras= 7 Marks • 101 to 150 TMCS/PTZ Cameras=6 Marks • 50 to 100 TMCS/PTZ Cameras=5 Marks • Less than 50 Cameras=0 Marks	10	As per PQ 5 – Relevant Experience under clause 2.2.
B3	Specific Experience in Vehicle Speed Detection System (VSDS)/ Vehicle Actuated Speed Display (VASD) – Radar/ANPR Camera-based speed detection /speed display solution	10	As per PQ 5 – Relevant Experience under clause 2.2.

	supplied and installed by bidder on Qualifying ATMS/ HTMS projects: • 41 and above VSDS/VASD = 10 Marks • 31 to 40 VSDS/VASD = 9 Marks • 21 to 30 VSDS/VASD = 8 Marks • 10 to 20 VSDS/VASD = 7 Marks • Less than 10 VASD/VSDS=0 Marks Note : 1. One VSDS/VASD shall be considered as a set of complete system including Radar/ANPR with display system(s) installed on a gantry/pole.		
B4	Specific Experience in Video Incident Detection System (VIDS) or Video Incident Detection & Enforcement System (VIDES) supplied and installed by bidder on Qualifying ATMS/ HTMS projects: Total quantity of VIDS/VIDES deployed on single or multiple projects collectively, successfully supplied and installed by the Bidder: • 41 and above VIDS/VIDES = 10 Marks	10	As per PQ 5 – Relevant Experience under clause 2.2.

	31 to 40 VIDS/VIDES = 9 Marks 21 to 30 VIDS/VIDES = 8 Marks 10 to 20 VIDS/VIDES = 7 Marks - Less than 10 VIDS/VIDES=0 Marks		
B5	ATMS/HTMS Integration with e-Challan (NIC) ATMS /HTMS software shall be integrated with the e-Challan process of NIC for any Indian Highways/ Expressways/ Urban Sector. - Each Qualifying Project = 1 mark - Maximum Score = 5 Marks	05	a) For E-challan: Bidder Undertaking (containing list of projects) along with supporting evidence of challan issuance and NIC integration.
C	Approach & Methodology and Demonstration	30	
C1	Detailed Approach & Methodology Document and Presentation containing the following minimum information: - Detailed Methodology, - Technical Work plan, - Solution architecture, - Implementation plan, - Design concept of system, - ATMS application functionalities, - Operation and Maintenance Service Plan for ATMS,	10	Form T-12 Approach & Methodology

	VIII. Equipment Safety Plan, IX. Networking Layout Diagram, X. Data processing flow & security		
C2	Demonstration of ATMS Software	20	Technical demo of ATMS software shall have to be presented by Bidder. Assessment of Technical Demo of ATMS software shall be done by the Bid Evaluation Committee / Technical team of Experts as finalized by NWPPL.
Minimum Score for technical qualification= 75 Marks			

2.4 Additional Qualifications

- 2.4.1 The 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. **The OEM should have a minimum of three (3) years of operating history from the date of its first order or product supplied.**
- 2.4.2 Bidder 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. This condition shall also be applicable on sub-contracting of any works / goods / services, etc. In case, any amendment has been issued in

continuation of the above-mentioned circulars by the respective departments/ministries, the same shall be applicable.

- 2.4.3 The requirements mentioned in Request for Proposal (RFP) are the minimum requirement. The Contractor shall provide the latest standards or higher specification to meet the functional and technical requirement which should be agreeable to client. In case any specification mentioned in the document are obsolete, he shall provide the latest equipment of higher specification, fully meeting the functional and technical requirement which should be agreeable to the authority. The Bidder must promptly highlight the compatibility issues in the Non-Compliance Matrix in the technical bid. Any Non-Compliance or Compatibility issue raised by the Contractor after the award of the Work shall not be acceptable in any circumstances. The Contractor must take prior written approval from the Authority before supplying any alternate solution proposed for any unavailable / obsolete /end of life component, by submitting the proof and undertaking from the OEM proposed in the Technical Bid.
- 2.4.4 **Undertaking for Country of Origin:** The Bidder shall ensure that none of the key component or its sub-component are procured / sourced from the OEM or its subsidiary from any of the region and / or company barred / banned / blacklisted / having territory dispute / restricted by the any of the Defence Department / any of the Government Department / Authority / PSU / Ministries etc. in India. The bid may be considered as non-compliance / non-responsive in case this requirement is not fully met by the Bidder(s). The Bidder shall submit an undertaking fully complying to this requirement.
- 2.4.5 The Bidder shall furnish the registration status of the sub-contractor/ supplier to the Authority.
- 2.4.6 Bidders are hereby instructed to submit valid credentials and accurate undertaking(s) to confirm adherence to the RFP requirements. NWPPL retains the sole authority to verify the authenticity of all credentials and information with the respective issuing entities. Any experience certificate, work order, or undertaking found to be false will lead to the rejection of the bid and the blacklisting of the bidder by NWPPL.

2.5 Manufacturing Authorization:

2.5.1 Bidder shall submit a Manufacturer's Authorization Certificate specific to this tender towards Supply and support during extended warranty up to 5 Years favoring the Bidder. Manufacturer's authorization favoring the bidder is a must for following components.

1. Video Wall & Controller
2. Network Switches
3. Server and Workstations
4. TMCS and VIDES Local Processing Unit (LPU)

5. Cameras:

- a. TMCS/PTZ Cameras
 - b. Automatic Number Plate Recognition Camera
 - c. VIDES Camera
6. Speed Radars
 7. Variable Message Sign (VMS)
 8. Vehicle Actuated Speed Displays
 9. **Software:**
 - a. ATMS Central Software
 - b. Analytics Software for TMCS, VIDES & ANPR
 - c. Software for Audio Communication Unit
 - d. Video Analytics and Management Software (VAMS) for Video Recording Server
 - e. COTS Network monitoring System
 - f. COTS Helpdesk & Inventory Management system

Note: All COTS Software must be mandatorily Third-Party solutions.

2.5.1.1 Bids without the Manufacturer's Authorisation Certificate from manufacturer / OEM may be rejected. All Manufacturer's Authorisation Certificate shall be on the letterhead of Manufacturer/OEM. In case, any equipment/system is manufactured/developed by the bidder in-house, the bidder shall submit the Manufacturer's Authorisation on their own letter head for all such equipment/systems.

- 2.5.1.2 The Evaluation committee may seek clarification from the Bidder and may ask the Bidder to submit the Manufacturer's Authorisation Certificate for any other sub-system or key component not mentioned above, during the technical evaluation stage.
- 2.5.1.3 Submission of the Manufacturing Authorization Form (MAF) for **CCTV camera components** is optional at the time of bid submission. However, the Bidder shall provide a written undertaking within their bid that, if selected for award of work, they shall furnish the MAF along with all other required documents prior to the commencement of supply.

2.6 Accessing RFP Documents, Preparation and Submission of BID

- 2.6.1 Detailed RFP document can be viewed / downloaded from NHIT website.
- 2.6.2 Website for accessing RFP is <https://nhit.co.in>. The Bidders shall submit the proposal as per criteria laid down in the RFP. The bidding process timelines are mentioned in the RFP as Schedule of the Tender part-I.

2.7 Bid Composition:

Bid shall comprise of the following:

2.7.1 **PART-1 (Technical Bid) in separate envelope**

- 2.7.1.1 Essential Documents:
- a) Proof of Tender Document Fee online payment.
 - b) Bid Security in the manner prescribed manner.
 - c) Original Power of Attorney in favour of Authorized Signatory in the Format prescribed in this document.
- 2.7.1.2 Technical Bid comprising various formats (Form T-1 to Form T-17, **except financial bid/form**) prescribed in this RFP along with all supporting documents. All the forms and supporting documents must be duly signed & stamped by the Authorized Signatory of bidder.
- 2.7.1.3 All supporting documents including applicable undertaking(s) to certify the Eligibility Criteria (Clause 2.2.) and Technical Qualifications (Clause 2.3).

- 2.7.1.4 Stipulated documentary evidence attested by the authorized signatory in support of his claim for fulfilling the prescribed eligibility criteria and
- 2.7.1.5 Undertaking on the fairness of bid documents in support of his claim while submitting the Bid (undertaking is part of Form T-1).
- 2.7.1.6 All the qualification and compliance documents as mentioned in the RFP.
- 2.7.1.7 Other documents
 - I. Copy of Certificate of Incorporation of Company.
 - II. GST Registration Certificate and PAN Cards.
 - III. Signed copy of Integrity Pact in the prescribed format.
- 2.7.1.8 Self-declaration about any conflict of interest prescribed in the RFP (Undertaking is part of Form T-1).
- 2.7.1.9 Undertaking for Country of Origin (Part of Form T-1)
- 2.7.1.10 **Technical Proposal–Approach & Methodology**
 - I. Approach & Methodology: The Bidder shall describe the proposed works in full details in his Technical Proposal **(Form T-12 Approach & Methodology)** to enable the NWPPL to evaluate the technical adequacy of the proposed system/solution. The NWPPL may reject the non-compliant proposal, in case not found in order.
 - II. The Bidder shall propose and describe in detail in his Technical Proposal the approach, methodology, technology and procedure of the detailed design of the ATMS System. Expected output of the detailed design shall be described together with the submission schedule for review and approval by the NWPPL.
 - III. For the items for which type, procedure, method, or configuration is left to the supplier's design, bidder shall clearly indicate in his proposal the type, procedure, method or configuration he chooses with the reason to the satisfaction of the authority.
 - IV. The Technical Proposal shall describe in detail how the system requirements defined in the Tender Documents will be achieved with block diagram, data flow, and timing chart. Where the supporting documents are provided, a cross reference shall be prepared. The Technical Proposal shall be written in English only.

- V. The Technical Proposal shall include the description of system as a whole and other equipment comprising of the System. The description shall include complete process, flow and processes.
- VI. Equipment comprising the system/solution shall be defined in detail.
- VII. Bidder shall ensure that proposed system should include the functionality that Failure of one component or module shall not cause the failure of any other component or module.
- VIII. The Bidder shall submit the network communication layout plan of the project in the Technical Proposal for reference.
- IX. The Bidder shall include in the Technical Proposal, the software quality assurance program that he intends to adopt in developing the software.
- X. Attested copy of the Certifications, test reports, etc. specified in the ToR shall be provided.
- XI. **Project implementation plan:** Work Break Down Schedule including Plan for delivery, installation plan, safety compliances etc should be part of the project implementation plan.
- XII. Manpower Deployment Plan,
- XIII. Strategy for compliance to SLA should be defined in the document.

2.7.1.11 **Technical Proposal-Specification Compliance**

- I. List of Proposed Components along with Make & Model, and required minimum specifications details in the **Form T-8: Make and Model List (Unpriced BoM)**.
- II. Technical specifications along with datasheet considering the requirements below:
 - a) Environmental conditions of all components
 - b) Physical dimensions of all components
 - c) Power consumption details
 - d) Operation console layout Electrical and/or mechanical specifications
 - e) Specifications of interface with other equipment
 - f) Catalogue, brochure, or another supporting document (if any)
 - g) Brand, make, model, and/or type (only one for each component)

- III. **Details and specifications about third party modules:** Bidder shall submit the details along with product catalogue for Commercially available off-the-shelf (COTS) based “Network Monitoring System” and “Helpdesk & Inventory Management system”. The solution shall be enterprise edition software as specified in the ToR/BOQ and no proprietary software/ module will be accepted.
- IV. The Bidder shall specify in the Technical Proposal, the warranty of each component / sub-component in the Form MAF/Datasheet. The onsite warranty of all the components proposed by the bidder shall be for a period of minimum 5 years.

2.7.1.12 **Technical proposal with more than one make/model for each component shall be rejected.**

2.7.1.13 Any other item / document specified in the ToR for submission required for Technical Proposal.

Note: Any financial disclosure by the bidder in his technical bid will lead to rejection of bid and forfeiture of EMD.

2.7.2 **PART 2: Financial Bid In the prescribed format (in a separate envelope for each package)**

2.7.2.1 Bidder to fill the details only in yellow marked columns of excel sheet provided as financial bid format (F-1) along with this RFP.

2.7.2.2 In case bidder submits the financial bid for more than one package, each financial bid shall be kept in a separate envelope.

2.7.2.3 The bid should include all statutory taxes/ levies / surcharge on tax etc. but excluding GST (as applicable). Any tax, and / or any other levies, if altered in future and payable under the law, the same shall be borne by the client.

2.7.2.4 GST (as applicable on services) shall be reimbursed by client separately on production of proof of GST payment.

2.7.2.5 Bidder should note that Income tax payable by the Bidder is NOT reimbursable by NWPPL/NEPPL. However, TDS will be applicable on all payments made by NWPPL as per applicable law.

- 2.7.2.6 The Financial bid shall contain the item wise cost of supply installation testing and commissioning of ATMS system. The O&M cost quoted in financial statements **should not be less than 40% of CAPEX cost**, as per financial bid format (Form F-1), otherwise financial bid may be rejected.
- 2.7.2.7 In case, any information related to financial bid or cost, full or partial is found in the technical bid, the bid shall be rejected.

2.8 Bid Submission:

- 2.8.1 The bid shall be submitted **OFFLINE** at NWPPL office along with **Soft Copy in USB Flash Drive** following the instruction mentioned in RFP. The printed Copy of Technical Bid must be **Hard-bound**.
- 2.8.2 Separate 'Sealed Envelope' containing the '**Technical Bid**' and '**Financial Bid(s)**' (Separate envelope for Financial bid of Each Package) of the "Request for Proposal (RFP) for Selection of System Integrator for Design, Supply, Installation, Configuration, Integration, Testing, Commissioning and O&M of Advanced Traffic Management System (ATMS)". The title shall be as mentioned below:

1. Title for Technical bid Envelope:

Technical Bid for "Request for Proposal (RFP) for Selection of System Integrator for Design, Supply, Installation, Configuration, Integration, Testing, Commissioning and O&M of Advanced Traffic Management System (ATMS)"

2. Title for Financial bid Envelope for Package-01

Financial Bid for Package-01: "Request for Proposal (RFP) for Selection of System Integrator for Design, Supply, Installation, Configuration, Integration, Testing, Commissioning and O&M of Advanced Traffic Management System (ATMS)"

3. Title for Financial bid Envelope for Package-02

Financial Bid for Package-02: “Request for Proposal (RFP) for Selection of System Integrator for Design, Supply, Installation, Configuration, Integration, Testing, Commissioning and O&M of Advanced Traffic Management System (ATMS)”

4. Title for Financial bid Envelope for Package-03

Financial Bid for Package-03: “Request for Proposal (RFP) for Selection of System Integrator for Design, Supply, Installation, Configuration, Integration, Testing, Commissioning and O&M of Advanced Traffic Management System (ATMS)”

- 2.8.3 All Technical and Financial bids should be kept in a single large envelope/box. The bidder’s firm name along with address and RFP Title should be printed on the envelope:

“Request for Proposal (RFP) for Selection of System Integrator for Design, Supply, Installation, Configuration, Integration, Testing, Commissioning and O&M of Advanced Traffic Management System (ATMS)”.

- 2.8.4 The title shall be clearly mentioned/printed on the respective envelopes, and all envelopes shall be put in a single large envelope/box for submission.
- 2.8.5 The Bidder shall submit **electronic copies (Soft Copies) of both the Technical Bid and the Financial Bid on separate USB flash drives.**
- 2.8.6 The USB flash drive containing the soft copy of the Technical Bid shall be **enclosed within the sealed Technical Bid envelope**, alongside the required hard copies of the Technical Bid.
- 2.8.7 The USB flash drive containing the soft copy of the Financial Bid for Package-01 must be enclosed within the sealed Financial Bid envelope for **Package-01**. Similarly, the USB flash drive containing the Financial Bid for Package-02 must be enclosed within the sealed Financial Bid envelope for **Package-02**. The same procedure applies to **Package-03**.

- 2.8.8 **The USB flash drive containing the Technical Bid documents shall not include any data, information, or references that may reveal the Bidder's proposed Financial Bid.**
- 2.8.9 In the event of any discrepancy between the hard copy and soft copy, the hard copy shall prevail.
- 2.8.10 The Bid document should reach the NWPPL office at the latest by date/time mentioned in the Notice inviting Tender (NIT), in hard copies/in original and shall remain valid for 120 days thereafter.
- 2.8.11 The proposal should be signed by the authorized signatory of the Bidder, supported by the relevant authorization document. No Proposal will be entertained after the due time and date, as stated above. NWPPL shall not be responsible for any delay whatsoever in nature. The proposals received after the due time and date will be summarily rejected.
- 2.8.12 The proposal should be in the manner and format as prescribed in RFP i.e. Technical Forms and Form of Financial Bid. Please note that proposals with any condition will be summarily rejected.
- 2.8.13 NWPPL reserves the right to accept or reject any or all the offers without assigning any reason.

2.9 Bid Validity

The bid should remain valid for a period of **120 calendar days** from the bid due date. NWPPL will make its best efforts to complete the evaluation process and award the work within bid validity period. Under exceptional circumstances, prior to expiry of the bid validity, NWPPL may request bidder to extend the bid validity for specified additional period. Such request by NWPPL 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 forfeiture of their bid security.

2.10 Modification/Substitution/Withdrawal of Bids

- 2.10.1 The Bidder may substitute or withdraw its bid after submission prior to the Bid due date. No Bid shall be allowed to be substituted or withdrawn by the Bidder on or after the Bid due date.
- 2.10.2 Any alteration/modification in the Bid or additional information supplied subsequent to the Bid Due Date, unless the same has been expressly sought for by NWPPL, shall be disregarded.
- 2.10.3 Partial modification of the Bid is not allowed. The Bidder will have to submit the revised bid again in a sealed envelope, as per Clause 2.8 above, mentioning "Revised Bid" on the top of the sealed envelope and the original bid envelope will be returned to the Bidder. No Bid may be modified after the Bid Due Date.

2.11 Amendment to RFP Documents:

- 2.11.1 Any modification in the RFP document shall be made by NWPPL separately through issue of Corrigendum /Addendum/ Amendment.
- 2.11.2 At any time prior to the bid due date, NWPPL, 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 NHIT's web site only and should be taken into consideration by the prospective bidders while preparing their Bids.
- 2.11.3 In order to give prospective Bidders reasonable time to take the amendment into account in preparing their bid, NWPPL may, at its discretion, extend the bid due date.
- 2.11.4 The Bidder must read all the instructions in the RFP and abide by the same accordingly.

2.12 Cost of Bidding

The Bidder shall be responsible for all the cost associated with the preparation and submission of their Bids including subsequent negotiation, PoC, Demo, visits to NWPPL, project sites etc. NWPPL shall not be responsible in any way liable for such costs, regardless of the conduct or outcome of the bidding process.

2.13 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 such 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.

2.14 Opening & Evaluation of Bids

2.14.1 **Opening of Technical Bid:** The Bids will be opened after the due date at the time prescribed in the RFP document in the presence of the Bidders/Authorised representatives who choose to attend. NWPPL will subsequently examine and evaluate the Bids in accordance with the provisions set out herein.

2.14.2 **Pre-Qualification Stage:** The following documents shall be evaluated as per part of Pre-Qualification stage during bid opening: –

- I. Tender Document Fee
- II. Bid Security in prescribed manner
- III. Power of Attorney, and
- IV. Other documents and appurtenant annexures indicating eligibility of the bidder.
- V. NWPPL reserves the right not to proceed with the Bidding Process at any time without notice or liability and to reject any or all Bid(s) without assigning any reasons.

2.14.3 **Tests of responsiveness**

2.14.3.1 Responsiveness of the bids received shall be evaluated based on the technical documents submitted in physical form such as Bid Security, PoA, applicable Undertaking(s), Technical forms and compliance with RFP.

2.14.3.2 Prior to evaluation of bids, the NWPPL shall determine whether each Bid is responsive as per the requirements of the RFP, **A bid will be declared “Non-responsive” in case:**

- I. a bid is not accompanied with EMD/Bid Security and tender Fee as per RFP.
- II. a Bidder submits more than one Bid against the RFP.
- III. the physical bid submissions are incomplete/ inadequate to the requirements of the RFP Documents.
- IV. documents are submitted in loose sheets.
- V. the Power of Attorney or the Authorization Letter is not provided.
- VI. Bidder submits a conditional Bid or makes changes in the terms and conditions given in the RFP document.
- VII. failure to comply with all the requirements of RFP document by a Bidder.
- VIII. Bid is not submitted in the formats prescribed in the RFP document.
- IX. if any requisite document/ certificate is not found in the prescribed format, the same will not be considered while evaluating the bid and the same may lead to declaration of Bid as non- responsive.
- X. if the envelope containing physical submission is not sealed and not as prescribed in the RFP document.
- XI. a Bid valid for a period of time shorter than prescribed in the RFP document.

2.14.4 **Stage -1 Technical Evaluation:**

2.14.4.1 The Technical Bids will be evaluated by an Evaluation Committee. The Bidder shall have to fulfil all the Eligibility Criteria as specified in the RFP.

2.14.4.2 The Bidder shall have to submit all the required documents as per various formats provided in Annexures/Forms. These documents will be scrutinized during technical evaluation. Those Bidders who do not fulfil the terms and conditions of Eligibility Criteria as specified in the RFP will not be eligible for further evaluation.

- 2.14.4.3 Evaluation of Technical Bids by the Evaluation Committee shall not be questioned by any of the Bidders. NWPPL may ask Bidder(s) for additional information, visit to Bidder's site and/ or arrange discussions with their professional, technical faculties to verify claims made in Technical Bid documentation by the Bidder on the already submitted Technical Proposal at any point of time before opening of the Financial Proposal.
- 2.14.4.4 Technically Responsive bids shall be further evaluated in accordance with the provisions set out in this RFP.
- 2.14.4.5 NWPPL will subsequently examine and evaluate the bid documents submitted as above in accordance with the provisions set out in this RFP.
- 2.14.4.6 If any information furnished by the Bidder is found to be incomplete, or contained in formats other than those specified herein, NWPPL may, in its sole discretion, reject the bid.
- 2.14.4.7 Any information contained in the bid shall not in any way be construed as binding on NWPPL, its agents, successors or assigns, but shall be binding against the Bidder if the Project is subsequently awarded to it on the basis of such information.
- 2.14.4.8 NWPPL reserves the right not to proceed with the Bidding Process at any time without notice or liability and to reject any or all Bid(s) without assigning any reasons.
- 2.14.4.9 **Approach and Methodology Presentation:** The Bidder shall present a comprehensive Approach and Methodology document to the Client according to a schedule provided by the Client. This presentation may be conducted either online or in person at the Client's office, as specified by the Client. The Bidder is required to strictly adhere to the scheduled date and time for this presentation.
- 2.14.4.10 **ATMS Software Functionality Demonstration:** The Bidder shall demonstrate the full functionality of the proposed software to the Client for the purpose of technical evaluation. The Client shall intimate schedule for the demonstration in advance. This demonstration may be conducted either online or in person at the Client's office, as specified by the Client.
- 2.14.4.11 **Clarification from Bidder:** To assist in the examination, evaluation, and comparison of Bids, NWPPL may at its discretion, ask any Bidder for clarification

of his Bid. The request for clarification and the response shall be in writing by e-mail. Except in case any clarification is asked by NWPPL, no Bidder shall contact NWPPL on any matter relating to its Bid from time to time.

2.14.4.12 Based upon the completion of technical evaluation inline to conditions specified in the RFP, NWPPL shall announce the name of technically qualified Bidders who shall be eligible for financial bid opening.

2.14.5 **Stage -2 Financial Evaluation:**

2.14.5.1 The Financial Bids of only the Bidders who are declared as **technically qualified in Stage -1** will be opened.

2.14.5.2 The financial bids for all the packages shall be opened simultaneously.

2.14.5.3 The financial Bids that are not as per the format provided in Form F-1 may be liable for rejection.

2.14.5.4 The Financial bid shall contain the item wise cost of supply installation testing and commissioning of ATMS system. **The financial bid may be rejected if the quoted O&M cost is less than 40% of the total CAPEX cost.**

2.14.5.5 The Financial Bid Evaluation will be based on the "Quoted Value" quoted by the bidder which would be inclusive of all levies and taxes like Excise Duty, Custom Duty, packing, forwarding, freight and insurance, Octroi/Entry Tax, etc. or as applicable taxes, but exclusive of GST. If any Bidder quotes NIL charges for all the items, the bid shall be treated as unresponsive and will not be considered.

2.14.5.6 If there is a discrepancy between words & figures, the amount in words shall prevail. If the bidder does not accept the correction of errors, its Bid shall be rejected and the EMD will be forfeited.

2.14.5.7 **Errors & Rectification:** Arithmetical errors will be rectified on the following basis:

- I. If there is a discrepancy between the unit price and the total price that is obtained by multiplying the unit price and quantity, the unit price shall prevail and the total price shall be corrected.
- II. If there is a discrepancy between words and figures, the amount in words will prevail". If the bidder does not accept the correction of errors, its Bid shall be rejected.
- III. If there is a discrepancy between the Quarterly Price & the Total Bid Price for O& M services, the Quarterly price shall prevail and NWPPL shall

correct the Total Bid Price for O& M charges. The Evaluation Committee shall determine if the financial bid is complete and without computational errors. The Bid with the lowest price will be selected.

2.14.5.8 The bidder that has quoted the lowest Quoted Value ("L1 Bidder") shall be declared as the successful bidder for the Package in line to award criteria mentioned in this RFP.

2.15 Award Criteria

2.15.1 The tender shall be awarded to the bidder whose financial quote is determined to be the **lowest one (L-1)**, provided that the bidder meets all requirements as specified in the Request for Proposal (RFP).

2.15.2 The maximum number of packages that may be awarded to any single bidder is restricted to one (1), subject to condition set out in this RFP.

2.15.3 Award of Work shall be carried out in package-wise sequence i.e. the L-1 Bidder of Package -01 shall be identified first and thereafter that in Package -02 and Package-03.

2.15.4 In the event, the same bidder emerges as L-1 bidder for multiple packages, Package-01 will be allotted to that L-1 bidder. For the remaining package(s) shall be awarded to the **next eligible bidder*** for the respective package (subject to acceptance), at the lowest quoted price of that respective Package. The award procedure and sequence shall be as mentioned below:

2.15.4.1 **Package-01 Award:** Package-01 shall be allotted to the L-1 (Lowest-1) bidder identified for Package-01.

2.15.4.2 **Package-02 Award:** Following the award of Package-01, Package-02 will be awarded to the **next eligible bidder*** of Package-02. The award will be made at the lowest quoted price of Package-02.

2.15.4.3 **Package-03 Award:** Subsequently, Package-03 will be awarded to the **next eligible bidder*** of Package-03. The award will be made at the lowest quoted price of Package-03.

***Next Eligible Bidder Definition:** The "next eligible bidder" refers to the bidder who submitted the next lowest financial bid for the respective package, and

who has not already been awarded another package under this tender. If a designated "Next Eligible Bidder" chooses not to accept the lowest price offered for that package, the next bidder in line, with the subsequent lowest price, will then be considered.

2.15.5 In the event of NWPPL could not determine the eligible bidder (in any of the package) through above defined process, NWPPL may ask any technically qualified bidder (from any package) to match the lowest quoted price of particular package OR may at its sole discretion to take the appropriate decision including re-tendering or re-calling the fresh financial bids from technically qualified bidders except the bidder who has been already awarded any package under this tender.

2.15.6 In the event that two or more Bidders quote the same lowest Quoted Value for any Package, NWPPL may

- I. Declare the bidder with higher technical score
- II. Take any such measure as may be deemed fit at its sole discretion

2.16 Imbalanced Bid:

2.16.1 If the Bid of the Successful Bidder appears significantly overpriced or undervalued beyond **20%** with respect to NWPPL estimate of the cost of work to be performed under the Contract, NWPPL may require the Bidder to produce detailed price analysis for any or all items of the Services/Bill of Quantities, to demonstrate the internal consistency of the proposed System/Proposal.

2.16.2 After evaluation of the price analyses, If the Bid is undervalued NWPPL may require that the amount of Performance Security set forth in the RFP be increased and an additional Performance Security may be obtained at the expense of the Successful Bidder to a level sufficient to protect Client against financial loss in the event of default of the Successful Bidder under the Contract or Client may re-call the tender or call for fresh financial bids.

2.16.3 The amount of the additional increased Performance Security shall be equal to the seriously imbalanced amount, which shall be final, binding and conclusive on the Bidder.

2.17 Letter of Award

The Successful Bidder shall be intimated by NWPPL/NEPPL 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. NWPPL/NEPPL shall have the right to get the bank guarantees verified from the respective issuing bank. Upon receipt of verification, the successful bidder shall be entered into a contract agreement with NWPPL/NEPPL. The format of Contract Agreement is prescribed in the RFP Document.

2.18 Performance Security

- 2.18.1 Upon issue of a Letter of Award (LoA) by NWPPL/NEPPL, 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 10 days***. The PBG shall be for an amount of **10% of Total Bid Value** quoted in the financial bid of respective package and should be in favour of **"NWPPL/NEPPL"**, New Delhi. The Performance Security shall be valid for minimum period of Six (6) years with additional claim period of six(6) months. In case the contract is extended, the Contractor shall extend the validity of PBG appropriately such that it remains valid until six months beyond completion of the contract.
- 2.18.2 The PBG shall be issued from Any National Bank or Scheduled Commercial Bank approved by RBI in India.
- 2.18.3 After acceptance of Performance Security by NWPPL/NEPPL, the Bid security of the Successful Bidder shall be returned by NWPPL without interest.

2.19 Indemnity

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

2.20 Proprietary Data

All documents and other information provided by NWPPL or submitted by a Bidder to NWPPL shall remain or become the property of NWPPL. Bidders are to treat all information as strictly confidential. NWPPL 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 NWPPL in relation to the services shall be the property of NWPPL. However, unopened financial bids of technically disqualified bidders shall be returned to the respective bidders.

The Contractor shall not keep any copy of the data/ video with them without prior permission of the Client. The Contractor shall not use any data / video for any purpose other than that permitted by Client. Adequate cyber security measures shall be taken by the bidder to protect the entire system and data from cyber-attacks and data theft.

2.21 Right to Amend Scope

Client reserves the right to amend the scope tendered in the RFP **up to 20% of the contract value** (increase or decrease) without assigning any reason at any time during the Contract Period. Client makes no commitments, express or implied, that the full scope of work as described in this RFP will be commissioned.

2.22 Right to Vary quantity:

2.22.1 At the time of award of contract or during the Contract Period, the quantity of goods, works, scope or services originally specified in the bidding documents may be changed by NWPPL/NEPPL by a written communication to the Successful Bidder. It shall be without any change in the unit prices or other terms and conditions of the Bid and the bidding documents.

2.22.2 If NWPPL/NEPPL does not procure any line item(s) as specified in the Bill of Materials for procurement or procures less than the quantity specified in the RFP Document due to change in circumstances, the Successful Bidder shall not be entitled for any claim or compensation except otherwise provided in the bidding document.

2.22.3 Repeat orders for extra items or additional quantities may be placed on the rates and conditions given in the contract.

2.22.4 NWPPL/NEPPL may choose to procure additional material for any of the line item specified in Bill of Materials of the quantities per line item during the Contract Period. The Successful Bidder shall retain the same prices throughout the contract period.

2.23 Conflict of Interest:

2.23.1 The Bidder shall not have a conflict of interest that may affect the NWPPL RFP process. Any Bidder(s) found to have a Conflict of Interest; their bid shall be disqualified solely. In the event of disqualification, NWPPL shall forfeit and appropriate Bid Security/EMD as mutually agreed genuine pre-estimated loss and damage likely to be suffered and/ or incurred by the NWPPL and not by way of penalty for, inter alia, the time, cost and effort of NWPPL including consideration of such bids, without prejudice to any other right or remedy that may be available to NWPPL hereunder or otherwise.

2.23.2 NWPPL/NEPPL requires that the selected Bidder provides professional, objective, and impartial advice and at all times hold NWPPL/NEPPL'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 NWPPL/NEPPL.

2.23.3 An Bidder shall be deemed to have a Conflict of Interest affecting the bidding process, if:

2.23.3.1 constituent^{1*} of Bidder is also a constituent of another bidder; or

2.23.3.2 such Bidder, its member or its associate receives or has received any direct or indirect subsidy or grant from any other Bidder, its member or its associate; or

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

- 2.23.3.3 such Bidder has the same legal representative for purposes of this bid as any other Bidder; or
- 2.23.3.4 such Bidder, its member or its associates has a relationship with another Bidder, its member or its associates, directly or through common third parties, that puts 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 regarding the Bids or to influence the Bid of either or each of the other Bidder; or
- 2.23.3.5 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 NWPPL/NEPPL for this particular assignment, the Bidder shall not take up any other assignment that by its nature will result in conflict with the present assignment; or
- 2.23.3.6 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
- 2.23.3.7 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
- 2.23.3.8 The Bidder, its member or Associate (or any constituent thereof) and any other Bidder, its 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, its 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, 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 (a) 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 (b) 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

2.23.3.9 For purposes of this Bid 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.

2.23.3.10 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 NWPPL/NEPPL. All conflicts must be declared as and when the Bidder becomes aware of them.

2.18. Corrupt or Fraudulent Practices

NWPPL/NEPPL requires Bidder observe the highest standard of ethics during the procurement and execution of the Contract. In pursuance of this policy NWPPL/NEPPL:

2.23.4 Defines, for the purposes of this provision, the terms set forth below as follows:

2.23.4.1 "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;

2.23.4.2 "Fraudulent Practice" means a misrepresentation of facts in order to influence a procurement process or the execution of a Contract to the detriment of NWPPL/NEPPL, 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 NWPPL/NEPPL of the benefits of free and open competition;

2.23.4.3 "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;

2.23.4.4 "Undesirable Practice" means (i) Establishing contact with any person connected with or employed or engaged by NWPPL/NEPPL 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

2.23.4.5 "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.

2.23.5 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;

2.23.6 will blacklist/ declare an Bidder ineligible, either indefinitely or for a stated period of time, to be awarded any Contract by NWPPL/NEPPL 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 NWPPL/NEPPL Contract.

2.24 Miscellaneous

- I. This RFP document includes a format of the Contract Agreement to be executed with the successful bidder for providing stipulated services to NWPPL/NEPPL. Bidders are advised to study the RFP document along with its Corrigendum/ 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.
- II. 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.
- III. NWPPL/NEPPL will be at liberty to keep the credentials of the bidders submitted by them at bidding stage, The bidders shall have no objection if NWPPL/NEPPL uploads/ hosts the information pertaining to their credentials as well as of their key personnel.
- IV. 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.
- V. NWPPL/NEPPL, in its sole discretion and without incurring any obligation or liability, reserves the right, at any time, to;
 - a) 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;

- b) Consult with any Bidder in order to receive clarification or further information;
 - c) Retain any information and/ or evidence submitted to NWPPL/NEPPL by, on behalf of, and/ or in relation to any Bidder; and/or;
 - d) 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.
- VI. NWPPL/NEPPL 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. No correspondence will be entertained on this matter.
- VII. It shall be deemed that by submitting the Bid, the Bidder agrees and releases NWPPL/NEPPL, 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.
- VIII. **Verification and Dis-qualification:** NWPPL/NEPPL 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 NWPPL/NEPPL, make available all such information, evidence and documents as may be necessary for such verification. Any such verification or lack of such verification, by NWPPL/NEPPL shall not relieve the Bidders of its obligations or liabilities hereunder nor will it affect any rights of NWPPL/NEPPL thereunder.
- IX. NWPPL/NEPPL reserves the right to reject any Bid and/ or declare it non-responsive, if:
- a) At any time, a material misrepresentation is made or uncovered, or

- b) The Bidder does not provide, within the time specified by NWPPL/NEPPL, the supplemental information sought by NWPPL/NEPPL for evaluation of the Bid.

2.24.1 Any 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 NWPPL/NEPPL reserves the right to take any such measure as may be deemed fit in the sole discretion of NWPPL/NEPPL including annulment of the Bidding process.

PART-II: TERMS OF REFERENCE

3 GENERAL REQUIREMENTS FOR THE ATMS

Implementing an Advanced Traffic Management System (ATMS) on national highways is crucial for enhancing road safety. ATMS can significantly reduce the occurrence of accidents by identifying and addressing major traffic violations proactively, furthermore, the system facilitates timely assistance to accident victims within the critical '**golden hour**', thereby improving the chances of survival.

The ATMS system envisaged by the NWPPL/NEPPL is to make use of Intelligent Transportation System (ITS) as an effective tool to enhance road / user / commuter safety by:

- I. ATMS can provide real-time data on traffic conditions, congestion, Incidents, and accidents, allowing for dynamic traffic management to minimize bottlenecks, accidents, and delays.
- II. Automated systems swiftly detect incidents or accidents, alerting the control centre management team for a rapid response, reducing secondary accidents, and enhancing safety by saving lives within the critical "golden hour."
- III. Efficient traffic management during incident occurrence.
- IV. Maximizing traffic throughput on the highway

The objective of ATMS envisaged by the NWPPL/NEPPL to make road travel efficient and sustainable by enabling rapid clearance of traffic congestion with efficient incident detection & management, provide real-time valuable travel advisories and enhancing traveler journey experience, and provide Stress-free travel by supporting effective and reliable accident / incident management, reliable enforcement, and useful travel advisories.

The ATMS system has been designed to assist the NWPPL/NEPPL in substantial reduction in accidents due to early incident detection and warning, saving human lives within the 'Golden hour'. The ATMS system shall assist in reduction of traffic congestion incidents there by improvement in average travel time and high level of enforcement leads to significant reduction in over-speeding.

The basis of selection of Sub-systems & placement of Key ATMS Components shall be based on the multiple site surveys that shall be conducted by the ATMS Contractor with ITS Consultant and NWPPL/NEPPL team in coordination with the concerned Police department and other stakeholders. Black-spots shall be identified during the surveys and crucial sub-systems to monitor & alert the users shall be proposed.

The system shall intelligently monitor the entire stretch of the Highway with the help of PTZ based surveillance cameras (TMCS herein) and video incident detection & enforcement system. The system shall automatically detect any incident on the highways/expressways and alert the route patrol team/rescue team about the incident, hence the incident management module of the system shall be able to reduce the response time and help the rescue team to provide the required assistance to the accident victims within the Golden hour. Early detection of incident shall enable the rescue teams in providing appropriate warnings to the road users about the incident and early action to clear the obstacles from roads to prevent further incidents and reduce congestion due to the incidents.

This Terms of Reference (ToR) section encompasses the Bidder's Scope of Work, Service Level Requirements, and technical specifications. The Bidder is required to comply with the scope, SLAs, and specifications mentioned in this RFP.

3.1 Overview of ATMS Solution

Sl#	Requirement	Description
1	Equipment Specification	Each equipment specification details specific performance requirements.
2	24/7 Operation	All ATMS equipment shall operate continuously, 24 hours a day, every day of the year.
3	Continuous Operation Duration	Each equipment type must operate continuously for a specified duration as defined in the relevant section of the document, within the ATMS project environment.
4	Mean-Time-To-Repair (MTTR)	Each equipment item shall have a specified MTTR (time to resume full operation after a failure) outlined in the service level agreements. Equipment failures and MTTR metrics will

SI#	Requirement	Description
		be monitored and recorded by a dedicated computerized ATMS Asset Management system, maintained for audit by NWPPL/NEPPL or its representative.
5	Maintenance Procedures	Routine and preventative maintenance procedures must be provided for all ATMS equipment to ensure operation within prescribed service levels.
6	Full Functionality in Project Environment	All ATMS equipment must maintain full functionality and operate within specification limits under project environmental conditions.
7	Operating Temperature and Humidity Range	All equipment shall function as specified in temperatures ranging from -10°C to 55°C and 95% relative humidity (non-condensing).

3.2 Submittals

SI	Requirement	Description
1	Compliance with Specifications	All ATMS equipment must, at minimum, satisfy the requirements outlined in the referenced specifications. Equipment exceeding these minimum requirements is acceptable.
2	System Redundancy	The ATMS should be designed to minimize the impact of individual component failures. A single component failure should not cause complete system failure or cascade to other components.
3	Documentation and Design Approval	All product data, design drawings, and construction drawings must be submitted to the Client.

3.3 Quality Assurance

SI	Requirement	Description
1	Quality System Documentation	The ATMS equipment provider must possess a quality system documentation that aligns with ISO 9001 standards. This documentation should encompass the design, development, and production activities related to the ATMS equipment being supplied. This requirement applies to all locations where

SI	Requirement	Description
		these activities are carried out, unless otherwise agreed upon by Client or its designated representative.
2	Quality System Audit	NWPPL/NEPPL holds the right to audit the potential supplier's quality system and testing facilities. This audit will be conducted before granting approval to the proposed supplier. The supplier must have an internal facility to integrate all major field equipment and demonstrate this capability to Client.
3	Electrical Installations	The design and installation of electrical installations must adhere to the standards set by the Bureau of Indian Standards.
3	Equipment Samples and Approvals	The service provider is responsible for providing samples of the proposed equipment at their own cost, If required. They must also furnish all associated approvals, test reports, and schedules to confirm that the equipment fulfills Client's requirements.

3.4 Remote Access during the Contract period

SI	Requirement	Description
1	Field Access	All ATMS equipment shall provide secure access for data extraction and control from a local laptop via wired (TCP/IP, RS 232, RS 485) or wireless LAN connection. Securely transfer data to the ATMS server to recover any data loss. Automatically detect, log, and generate system alerts for data extraction/transfer events.
2	Data Access Software	The service provider shall use appropriate GUI-supported software for data access, control, and transfer to the ATMS database.
3	Remote Online Access	Provide continuous remote online access (via internet) with a dedicated IP for NWPPL/NEPPL to evaluate the functioning of each equipment/sub-system. Include real-time image observation and PTZ control for CCTV cameras. NWPPL/NEPPL can use evaluation results in service level assessments.

SI	Requirement	Description
4	Online Access Protocol	Each equipment/sub-system shall be IP-based, supporting SNMP, TCP/IP, RTSP, or a suitable method for online access.
5	Video Stream Access	Configure direct online access to video streams for each camera via RTSP, Port Forwarding, HTTP, WebRTC, Cloud NVR, or any protocol supported by ATMS Cloud applications.
6	Camera Registration	Register each camera (VIDES, CCTV, Command Center) on the Central ATMS Module or any other client owned/third party application with details like lat-long, public IP, RTSP URL, authentication, and web-link for individual camera stream access.
7	Reporting Tool	The online access tool shall include a feature for NWPPL/NEPPL to generate detailed performance, operation, and maintenance reports without service provider intervention.
8	Integration with Local Traffic Police	Integrate ATMS with the Local Traffic Police's Command and Control Centre, sharing live feeds of TMCS and VIDES cameras for viewing and/or control. View-only access through ATMS software login is acceptable.

3.5 Power Supply & Communications

- 3.5.1 The Client shall bear the establishment of power connections for the ATMS site equipment, up to the roadside meter installation.
- 3.5.2 The System Integrator is responsible for all costs associated with connecting field equipment from the roadside meter to the individual devices.
- 3.5.3 The System Integrator shall plan and execute the cable laying and accessory installations.
- 3.5.4 The System Integrator shall plan for utilizing a single power connection to serve multiple site equipment as per site requirement.
- 3.5.5 The system integrator is responsible for obtaining and managing the power connections for all RFP-specified site components, with prior client approval. The client shall directly pay all electricity costs (up to the meter connection),

both initial and recurring, for all ATMS system components. The system integrator shall facilitate the ATMS system power connections in the name of client. The Commissioning of associated components shall be accepted only if the power connection is obtained at the concerned components.

- 3.5.6 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 backup to ensure 24 x7 operation.
- 3.5.7 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 to ensure 24 x 7 operation.
- 3.5.8 Except where detailed in specific sections below, all ATMS equipment shall be powered from either
 - I. A single phase 230Vac 50Hz supply.
 - II. A three phase 440Vac 50Hz supply.
- 3.5.9 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.
- 3.5.10 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.
- 3.5.11 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.
- 3.5.12 The enclosure shall be earthed in accordance with the relevant BIS regulations.

- 3.5.13 The enclosure shall include a 230Vac 15 Amps 3-pin dual socket power outlet conforming to BIS standard.
- 3.5.14 The power sockets shall be installed in accordance with relevant BIS standard.
- 3.5.15 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.
- 3.5.16 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
- 3.5.17 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.
- 3.5.18 ATMS equipment shall automatically regain full operational functionality when related electrical power supply is restored, without the need for manual intervention.
- 3.5.19 **Uninterruptible Power Supply (UPS) Subsystems**
- 3.5.19.1 The worst-case power-load data shall be used to design the electrical conductor sizes. These shall be submitted to the NWPPL/NEPPL and/or It's representative for approval.
- 3.5.19.2 A UPS shall be provided wherever required. The UPS shall meet the requirements of relevant standards of BIS.
- 3.5.19.3 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 network device locations. The Batteries of UPS system should be regularly replaced to ensure the specified back-up. The Power Backup shall be as mentioned in the below table:

Sl#	Equipment	Power Source	Backup
01	TMCS*1	Raw Power along with solar Power	06 Hours
		Only Solar Power	24 Hours
02	VIDES*1	Raw Power along with solar Power	06 Hours
		Only Solar Power	24 Hours
03	VASD	Raw Power along with solar Power	06 Hours
04	VMS	Raw Power along with solar Power	06 Hours

***1:** The RSU Quantity of Raw power supply along with solar power and Only Solar Power is equally divided into two parts in the financial bid, however the quantities may vary based on the actual site conditions and client requirements. The payment shall be made accordingly.

3.5.19.4 An Automatic Power Transfer Switch (APTS) shall be provided inside RSU 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.

3.5.19.5 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).

3.5.19.6 Additional equipment necessary to eliminate the delay in the transfer of power sources which may cause the ATMS equipment to reboot shall be provided.

3.5.19.7 Each external power supply line shall be terminated at the APTS.

3.5.20 **Earthing:** All earthing of ATMS equipment shall comply with BIS regulations.

3.5.21 **Networking**

The field equipment shall be connected to the ATMS Control Centre via an optical fiber network using suitable interfaces. Please refer the clause **4.11** and clause **6.6** of this document for details of telecommunications and networks.

4 SCOPE OF WORK

The “Contractor” (Hereinafter may be as “System integrator”) shall undertake the following activities for the ATMS project:

1. Conduct detailed site surveys and assess the Feasibility for ATMS Components.
2. Prepare detailed design documents and drawings according to specification mentioned in the RFP, meeting the specification prescribed in the guidelines vide ref-NHAI/Policy Guidelines/ Standard Documents/2023, Policy Circular No.11.53/2023 dated 10th October 2023.
3. Conduct factory inspection of equipment and materials,
4. Procure and supply all necessary ATMS equipment, materials, spare parts, test equipment, and tools.
5. Arrange for transportation and site delivery of all equipment and materials.
6. Installation of ATMS equipment as per approved design document.
7. Set up of Traffic Management Center (Control Center) for ATMS as per the specifications prescribed in the RFP.
8. Conduct the testing and commissioning of the ATMS system as defined in the RFP.
9. Provide comprehensive training to project personnel and operation & maintenance team.
10. Prepare as-built drawings upon implementation of the ATMS project and successful completion of SAT.
11. Provide DLP services for 01 years comprehensive Operations and Maintenance (O&M) for 04 years, (total duration 05 years).

4.1 Geographical Scope

The Geographical Scope of Advanced Traffic Management System is divided into two packages. The Package details are as mentioned below:

Sl#	Package	Project Name	Project Length	Control Centre	Responsible SPV
1	Pkg-01	Kaljhar-Patacharkuchi Project Highway of National Highway - 27 commencing from km 1013+000 of NH-27 at Kaljhar and ends at km 1040+300 at Pattacharkuchi in the state of Assam	27.3 KM	Control Centre- 01	NEPPL
		Lakhnadon-Mahagaon(Mohgaon)-Khawasa Project Highway Stretch starts from Km 546+420 and ends at Km 653+770 km on NH-44 (old NH-7) in the State of Madhya-Pradesh	107.35 KM	Control Centre- 01	
2	Pkg-02	Chittorgarh-Kota Project Highway Stretch starts from km 891+929 at Chittorgarh Bypass and ends at km 1052+429 at Kota on NH-27 in the State of Rajasthan	160.5 KM	Control Centre- 01 Sub Center-01	NWPPL
3	Pkg-03	Borkhedi-Wadner-Deodhari-Kelapur-Maharashtra/Telangana Border Start point of the Project stretch is near Borkhedi village in Maharashtra at existing km 36+600 and end point is at existing km 175+000 before the approach of major bridge on Penganga River at Maharashtra- Telangana border	138.4 KM	Control Centre- 01 Sub Center-01	NWPPL

4.1.1 **Package-01** : Components Quantity shall be as mentioned below:

Components	Kalihar-Patacharkuchi	Lakhnadon-Mahagaon(Mohgaon)-Khawasa
Traffic Monitoring Control System (TMCS)	27 nos.	112 Nos.
Video Incident Detection and Enforcement System (VIDES)	03 Nos	12 Nos
Vehicle Actuated Speed Display	02 Nos	06 Nos
Variable Message Sign M-Type	02 Nos	02 Nos
Variable Message Sign L-Type	0 Nos	08 Nos
Trolley VMS (Portable VMS)	02 Nos	02 Nos
Emergency Roadside Telephone System (or Emergency Call Box (ECB))	0 Nos	32 Nos
Optical Fiber Cable (OFC)	27.3 KM total length	78.06 KM total length (29.29 KM is already installed)
Command and Control Centre	01 ATMS Control Centre	01 ATMS Control Centre

4.1.2 **Package-02** : Components Quantity are as mentioned below:

Components	Chittorgarh-Kota
Traffic Monitoring Control System (TMCS)	170 Nos
Video Incident Detection and Enforcement System (VIDES)	17 Nos
Vehicle Actuated Speed Display	08 Nos
Variable Message Sign M-Type	02 Nos

Variable Message Sign L-Type	14 Nos
Trolley VMS (Portable VMS)	02 Nos
Optical Fiber Cable (OFC)	160.5 KM total length
Command and Control Centre	01 ATMS Control Centre and 01 Sub-Centre

4.1.3 **Package-03:** Components Quantity are as mentioned below:

Components	Borkhedi-Wander-Deodhari-Kelapur-Maharashtra/Telangana Border
Traffic Monitoring Control System (TMCS)	148 Nos
Video Incident Detection and Enforcement System (VIDES)	14 Nos
Vehicle Actuated Speed Display	07 Nos
Variable Message Sign M-Type	02 Nos
Variable Message Sign L-Type	10 Nos
Trolley VMS (Portable VMS)	02 Nos
Optical Fiber Cable (OFC)	138.4 KM total length
Command and Control Centre	01 ATMS Control Centre and 01 Sub-Centre

4.2 Existing Components Scope

Any existing components already installed on the project shall be re-utilized with integrated with ATMS system. Furthermore, System Integrator shall be responsible for the comprehensive AMC of all such existing installed ATMS equipment/systems throughout the contract period. The Following components are already available on the Lakhnadon-Mahagaon(Mohgaon)-Khawasa (Package-01) project:

Sl#	Equipment/Systems	Quantity
1)	VMS	1 Nos
2)	PTZ	03 Nos
3)	ECB	04 Nos
4)	ATCC	1 Nos
5)	VIDS	1 Nos
6)	MET	1 Nos
7)	OFC	29.29 KM

4.3 Turnkey Implementation:

The System Integrator shall deploy the Advanced Traffic Management System (ATMS) which comprises of the Traffic Monitoring Control System (TMCS), Video Incident Detection and Enforcement System (VIDES), Vehicle Actuated Speed Display System (VASD), Variable Message Sign (VMS) Board, Optical Fiber Cable(OFC) based Digital Communication System, and Other equipment/system mentioned in this RFP on Turnkey basis including the Operations and Maintenance period as per the requirement.

4.4 Equipment site plan / Indicative Equipment Location

The Bidder shall conduct the site survey and propose the ATMS sub-system location in the Technical Proposal. The location provided in this document shall be treated as indicative, The successful Bidder, in consultation with the Authority, have to ascertain the indicative locations and propose the appropriate equipment location during the design phase of the Contract. The successful bidder during design phase of the contract shall provide equipment locations duly marked in the KMZ file of the project highway.

4.5 Site Survey for ATMS Implementation

The System Integrator shall conduct the detailed site-survey before commencement of the ATMS Work. The detailed survey shall be done inline with the following key points:

4.5.1 Identifying Equipment Locations:

The System Integrator shall conduct the field survey of entire highway and identify the most suitable location considering meeting all the functional requirements of ATMS equipment/systems. The System Integrator should identify Areas with frequent congestion and accidents, Complex junctions with significant traffic flow, Enclosed Road sections with specific ventilation, Elevated roadways prone to structural issues, road curves, ramps, underpass etc to identify the location of Components.

4.5.2 **Assess Existing Infrastructure:**

The System Integrator should assess the Road network including lane configurations, road markings, and signage to ensure no obstruction or overlapping between two components. The location of road junctions, services roads, underpass etc especially should be taken-in for the implementation of ATMS. System Integrator should identify any other existing system installed like Traffic signals controller on junction, Police equipment or systems, Smart city or urban ITS components to ensure no disruption and overlapping with all such systems.

4.5.3 **Power Supply Assessment:**

System Integrator should Evaluate the availability and reliability of power sources. Wherever power connections are required, System Integrator should coordinate and find the right distribution channel in coordination with relevant agencies and complete all the related work of power establishment in coordination with the client. Overall responsibility for the **establishment and maintenance** of the field equipment power is lies with the system integrator, however the charges for monthly recurring electricity for the regulated power supply shall be paid by the client to the respective electricity board directly as per actuals.

4.5.4 **Network Communication Survey:**

The System Integrator shall conduct the survey of entire road network to setup the OFC based network communication system on the entire road stretch. The OFC shall be preferably installed in the median, in case the same is not available, alternative locations (LHS or RHS RoW) for the OFC laying shall be

opted. The OFC installation may be done either manual excavation or HDD, as per the site requirement. All the service road, underpass, ramps, entry/exit points shall be taken into consideration for the installation of OFC network. The System Integrator should consider and implement the secure, redundant (in topology, network protocols or communication mechanism) & stable OFC network while executing the survey for the communications for all field and control centre equipment.

4.5.5 Data Collection:

During the survey, System Integrator should collect the important data to plan the effective implementation of ATMS. The Accident data shall be analyzed considering the accident Blackspots and accident patterns. The Traffic volume and speed data to be made in consideration of historical and real-time traffic data. The System Integrator should Identify recurring congestion points and their causes using the data.

4.5.6 Evaluation of Site Conditions & Challenges:

System Integrator shall Assess the accessibility of sites for installation and maintenance and identify any physical obstacles or limitations. System Integrator shall Evaluate security risks and potential vandalism and consider environmental factors like temperature, humidity, and dust.

System Integrator should review all types of technical challenges related to complexity of integrating various systems and technologies. All Operational challenges should be assessed by Identifying potential disruptions to traffic flow during installation and maintenance.

4.5.7 Preparation of Software Design Document and obtain approval from client:

The System Integrator shall submit the solution design document complying with the requirements prescribed in this RFP. The design document shall contain (but not limited to) the final locations, make and models, installation procedures, traceability matrix with RFP compliances and other statutory requirements.

4.6 Conducting the FAT:

The System Integrator shall conduct the Factory Acceptance Test (FAT) inline to clause 8.2, before initiating the supply of material for which FAT is mandatory.

4.7 Material Supply:

4.7.1 Process for Supply of Materials:

- 4.7.1.1 The system integrator shall ensure to supply items as per BOQ and compliance of RFP specification and get them verified by Authority. The contractor shall arrange the Factory Acceptance Test (If applicable) for certain components as mentioned in the specification before the delivery. The responsibility of providing storage and security for supplied material shall be in the scope of contractor.
- 4.7.1.2 The System Integrator shall be fully responsible for the safety of equipment which shall be delivered or installed at site till closure of SAT by Authority/Client. Prior to SAT, if any equipment/sub-equipment/consumable gets non-functional/damaged due to any reason whatsoever, excluding scenario covered under force majeure, then system integrator shall be liable for replacing of damaged item without any financial implication to the client.
- 4.7.1.3 Contractor needs to supply all accessories, sub-components, sub-system even they are not part of BoQ lines items but essentials to make the system functional on full fledge basis. The system integrator shall provide all additional components required for daily operation including Backup Hard disk, pen drive etc., on Control Center as per the requirement.

4.8 Material Delivery Verification:

The contractor shall notify the material inspection request upon delivery of the item. Such requests can be raised once a week during, and client personnel may visit the warehouse/storage room to inspect the materials. Once the material delivery is confirmed, client personnel shall sign the "Material Inspection Report (MIR)". All the supporting documents, including the delivery

challan, make and models must be attached with MIR to claim the delivery payment. The signing of MIR for any material only confirms the material availability at site, however it doesn't provide acceptance of any material. The material may be accepted only after the System acceptance test.

4.9 Site Components Installation

4.9.1 Location Finalization

- 4.9.1.1 Conduct a comprehensive site survey to identify optimal locations for camera installation. The PTZ camera, VIDES, VASD location shall be finalized in consultation with client and associated consultant teams. The System Integrator shall ensure the 100% surveillance of the road stretch especially when the road is having the curves and blind zone. All underpasses, ramps, service roads, junctions, urban areas, markets and other high foot fall areas may have the additional PTZ installed for an effective incident management.
- 4.9.1.2 Develop a detailed installation plan, including camera placement, cabling routes, and power supply requirements.
- 4.9.1.3 Coordinate with relevant authorities for necessary permissions and approvals.

4.9.2 Installation:

- 4.9.2.1 System Integrator Procure all material, along with mounting arrangement, all types of cables, connectors, and other required hardware & accessories to require for successful installation and functioning the site components.
- 4.9.2.2 System Integrator shall construct the foundation and execute all ancillary civil work required for the pole/gantry erection wherever necessary. The System Integrator shall supply the robust Pole to handle the wind pressure of the site. In case there is any shake in video view of camera is observed due to pole vibration or wind pressure at any time throughout the contract period, the System Integrator has to take all corrective measures including the replacement of pole/gantry on its own cost.
- 4.9.2.3 Installation of site components at designated locations, ensuring proper alignment region setting and proper focus. System Integrator shall ensure that there is no hindrance in viewing 360 degrees from the PTZ camera. In case during system acceptance test, any hindrance or obstacle found to achieve

the viewing requirements of PTZ Camera, the camera shall be relocated to a suitable location at System Integrator's cost. The VIDES, VASD and VMS system to be installed to meet all the applicable requirements.

- 4.9.2.4 Mount site devices securely on poles or gantry structures, considering factors like visibility, accuracy, weather resistance, and vandalism prevention.
- 4.9.2.5 Install weatherproof and vandal/theft proof smart enclosures at site and junction boxes. The Junction box should have a smart sensor technology to detect and intimate the control centre application in real time basis whenever any tempering or vandal action or any suspicious activity observed.
- 4.9.2.6 Installation Raw power and Solar Pannel based power supply for the Site components to ensure functionality inline to the specification prescribed in the RFP. The Solar panel enclosure, stand, all other mounting arrangements, required cables, conduits, foundations and all other accessories shall be scope of the System Integrator.

4.9.3 **Cabling and Connectivity:**

- 4.9.3.1 The System Integrator shall connect the OFC for video transmission to control center. The connectivity between network switches to Camera may be done using the armored Cat-06 network cable.
- 4.9.3.2 The Power cable shall be installed between the power source to cameras, network switches and other peripheral devices at site.
- 4.9.3.3 The power supply systems must include power outlets and surge protectors. The System Integrator should install the lightening arrestor on the site poles/gantries to save devices from sky-lightening.
- 4.9.3.4 Configure network settings for IP cameras to ensure seamless integration with the surveillance system.

4.9.4 **Obtaining Power Connection for Site Components**

- 4.9.4.1 The System Integrator's scope regarding power connections encompasses the complete process of securing and implementing a reliable power supply from the local electricity board. This includes initiating the application for a new power connection, conducting thorough site surveys to determine optimal connection points and requirements, and preparing all necessary

documentation for submission to the electricity board. The System Integrator assumes end-to-end responsibility for obtaining the connection, ensuring compliance with all regulatory requirements and addressing any issues that may arise during the approval process.

- 4.9.4.2 The Client shall bear the financial expenditure for the power connection establishment cost (up to the meter installed on roadside) and monthly recurring cost as per actuals. This includes paying all electricity establishment costs to the respective electricity board. In addition to the expenses from the establishment cost of power supply from electricity board, System Integrator shall procure and supply all necessary cables to connect the field equipment with respective meters, accessories and materials required to complete the power connections. The System integrator shall ensure that all components meet industry standards and are compatible with the existing electrical infrastructure and bear all financial expenditures for providing the 24x7 uninterrupted power supply for ATMS field devices as per the NHAI/Policy Guidelines/ Standard Documents/2023, Policy Circular No.11.53/2023 dated 10th October 2023. This includes supply and installation of cables, conduits, junction boxes and any other required hardware(s).
- 4.9.4.3 The System Integrator's scope extends to all ancillary civil and mechanical work related to the power connection distribution. In addition to the expenses from the establishment cost of power supply from electricity board, system integrator shall also undertake tasks such as trenching, conduit installation, foundation work for electrical equipment, and any other necessary modifications to the site to accommodate the power connection. The System Integrator is responsible for ensuring that all civil and mechanical work is performed to a high standard, complies with relevant building codes, and is completed in a timely manner to facilitate the smooth implementation of the power connection.
- 4.9.4.4 **Maintenance of Power Connections:** During the Operation and Maintenance (O&M) period, it shall be full responsibility of system integrator for the maintenance of the power connections to the ATMS site equipment. This scope encompasses all necessary coordination with electricity boards and other associated departments to ensure uninterrupted power supply. The integrator is obligated to provide timely restoration of power in the event of

power cuts or cable damage, minimizing system downtime and maintaining operational continuity. This includes proactive monitoring, preventative maintenance, and rapid response to any power-related issues that may arise.

4.10 Setup of Traffic Management Center (Control Center) for ATMS:

The System Integrator shall design, set up and maintain the ATMS solution for control centers and sub-centers (if any) in accordance with the requirements outlined in the RFP. The Control Center building shall be constructed by the client; however, the System Integrator must closely monitor the construction progress to ensure the facility meets ATMS system needs. The System Integrator shall provide detailed requirements to the Client for the construction of the control center, including space requirements, power supply, and network infrastructure.

The system integrator shall execute the following work but not limited to:

- 4.10.1 Setup of operation room in control center which shall include the video walls, operator workstations, required furniture/accessories, PTZ Joysticks, Intercom system, PA system, and other control center components/accessories which are essential for the operation of ATMS. The System Integrator shall setup the operation room ensuring a minimum distance of 3 meters between the video wall and the first row of workstations.
- 4.10.2 Setup of Network, Intercom and any other required Connectivity or cables in the entire control room building including all the blocks and cabins as per the client requirements.
- 4.10.3 Supply and installation of ATMS Server, Video Server, Storage system, UPS, Battery Bank, Emergency lights, Servo stabilizer, and spare parts for critical equipment.
- 4.10.4 Deployment of ATMS solution in the Control center including the ATMS Central application, Camera's view setup on video wall, Dashboard for Video wall, GIS representation of equipment & incidents, Network Management System, Helpdesk and Inventory Management System.

4.10.5 Integration of ATMS with Other Systems including all traffic cameras, sensors, and other data sources along with Emergency Response Systems like Integration with police, fire, and emergency medical services and other services as required by the client time by time.

4.10.6 The System integrator shall supply the access control system in the Traffic Management Center to secure the access of Server Room, UPS Room, Control Room and other major cabins.

4.10.7 **Cabling and Power Distribution of Control Center:**

4.10.7.1 **Network Cabling:** The System Integrator shall design, supply, install, and terminate all necessary network cabling within the ATMS Control Centre, Server Room, and ATMS building

4.10.7.2 **Power Cabling:** The System Integrator shall design, supply, install, and terminate all necessary power cabling within the ATMS Control Centre, Server Room, and UPS Room and provide detailed cable routing diagrams and as-built documentation. All power cabling must adhere to local and national electrical codes.

4.10.7.3 **Power Distribution Board (PDB):** The System Integrator shall supply and install a complete Power Distribution Board (PDB) for the ATMS Control Centre, Server Room and UPS Room. The PDB shall include all necessary Miniature Circuit Breakers (MCBs), switches, and sockets to provide adequate power distribution. The PDB must include surge protection.

4.10.7.4 **Power Connection from Servo Stabilizer and UPS:** The System Integrator shall provide all necessary power cable connections from the Servo Stabilizer and UPS to all components within the ATMS Control Centre, Server Room, and ATMS building. The System Integrator shall ensure proper grounding for the protection and isolation of all ATMS components in the control center from the power failures, surge protection, short-circuits, electrical spikes, electromagnetic interference, and other parameters which impacts on the performance of ATMS equipment and systems.

4.10.7.5 **General Power Requirements:** All electrical work must comply with applicable electrical codes and regulations. All materials and workmanship must be of

high quality and suitable for continuous operation. The System integrator shall prepare and provide load calculations in the Design document.

4.11 Optical Fiber Cable (OFC) based Digital Communication System

The System Integrator shall be responsible for setup of the Digital Communication System throughout the road stretch, underpass, service roads, entry/exit ramps and all other facilities of Road stretch wherever ATMS surveillance, incident detection or any other ATMS functionality is required to be deployed. The Communication system shall be setup considering the following key points:

4.11.1 Network Design and Planning

- 4.11.1.1 Conduct a detailed survey of the highway route, including topography, existing infrastructure, and potential interference zones.
- 4.11.1.2 Design a robust and scalable OFC network topology, considering future expansion, redundancy and service requirements.
- 4.11.1.3 Develop detailed engineering drawings and specifications for the OFC network, including cable routes, duct layouts, and equipment installations.

4.11.2 Trenching, Ducting and Ancillary Civil Works for Communication System

- 4.11.2.1 Conduct necessary civil works, such as trenching, duct laying, manhole construction, and cable termination points, adhering to specifications and industry standards.
- 4.11.2.2 Providing the chamber cover, soil/sand filling in chambers, placing route markers (On every 100 Meters) for OFC installation and other associated work required for OFC.
- 4.11.2.3 Laying of Safety/warning tape (above one feet of OFC duct) before back filling the trench.
- 4.11.2.4 Ensure proper coordination with other utilities and agencies to minimize disruptions and obtain necessary permits.

4.11.3 OFC Cable Installation

- 4.11.3.1 Supply and Installation of high-quality optical fiber cables, including feeder and distribution cables, following industry best practices.
- 4.11.3.2 Splice and terminate OFC using precision tools and techniques to ensure optimal performance.
- 4.11.3.3 Test and certify the installed OFC to meet specified performance standards.
- 4.11.3.4 Procure and install network equipment, including OFC termination panels, patch panels, multiplexers, switches, routers, and power supplies.
- 4.11.3.5 Configure and integrate network equipment to meet the specific requirements of the project.
- 4.11.3.6 Conduct rigorous testing and commissioning of the installed equipment to ensure proper functionality.

4.11.4 **OFC Integration and Testing**

- 4.11.4.1 Integrate the OFC network with all ATMS Systems, Internet Routing and external systems/agencies as per the requirement of client.
- 4.11.4.2 Conduct comprehensive system testing, including OFC, network connectivity testing, and performance testing.

4.11.5 **Communication System Maintenance**

- 4.11.5.1 Provide comprehensive operation and maintenance (O&M) services for the OFC network, including routine inspections, fault diagnosis, and repair.
- 4.11.5.2 Establish a robust network monitoring system to proactively identify and address potential issues.
- 4.11.5.3 Provide 24/7 technical support to ensure uninterrupted network operation.

4.11.6 **Network Security Implementation**

- 4.11.6.1 Implement appropriate security measures to protect the OFC network from unauthorized access and damage.
- 4.11.6.2 Implement access control measures to restrict access to critical network components.
- 4.11.6.3 Develop and implement a security incident response plan.

4.12 Installation Acceptance Test

Once installation is completed, System Integrator shall call for the IAT to confirm the installation as per supplied quality and quantity. During the IAT, the authority shall verify the installation of components ensuring all standards and compliance. The IAT shall be conducted in accordance with Clause 8.3 of the RFP.

4.13 Go Live and System Commissioning

The System shall go-live upon completion of the Installation Acceptance Test of all the equipment of the ATMS.

4.14 System Acceptance Test

After the commissioning of the system, the System Integrator shall invite for the System Acceptance Test (SAT) to confirm the functionality and standards prescribed in the RFP. System Integrator shall arrange the SAT of all hardware and software installed for the ATMS system. The SAT shall be conducted in accordance with the RFP Clause 8.4

4.15 Defects Liability Period (DLP)

- 4.15.1 Any defects in the system identified by the Client and provided to the Service provider in the form of a written notice during the Final Acceptance 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.
- 4.15.2 Suitable tests for confirming the rectification of defects shall be performed by the Service provider to the satisfaction of the Client.
- 4.15.3 The Defect liability period shall be **minimum 01 year** from the date of system commissioning.

4.16 Operation & Maintenance

4.16.1 System Integrator shall Operate & Maintain (O&M) the ATMS systems inline to meet the operation requirement and minimize the downtime of all components considering the following key points:

4.16.1.1 The System Integrator shall provide Trained Manpower for Maintenance of control room systems, and ATMS site components.

4.16.1.2 System Integrator Responsible to maintain the ATMS project components comprehensively including the repairing and replacement.

4.16.1.3 Execute O&M as per clause 10 of this RFP.

4.17 Scope Relevance

4.17.1 The System Integrator shall also undertake the works that are not specifically mentioned in this Document and in the reference Drawings but essential for the efficient implementation and operations of the ATMS.

4.17.2 The requirements stated herein shall be construed as minimum requirement and meeting the respective requirements shall not relieve the System Integrator from the responsibility of supplying the ATMS that functions efficiently as a system and carry out its maintenance for a period of five years as stipulated.

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

4.17.4 The System Integrator shall check and review the design and this document prepared by the NWPPL/NEPPL, and execute the supplemental and/or additional and/or detailed design work as necessary at the System Integrator's cost and time, so that the System Integrator will supply and deliver the workable

4.17.5 Advanced Traffic Management System (ATMS) which will suit the intended purpose when supply & installation are completed as per the provisions of RFP. The System Integrator shall promptly notify the NWPPL/NEPPL and the

Independent Engineer (appointed by NWPPL/NEPPL for supervision of the ITS/ATMS works), of any error, omission, fault or any other defect in the design Document for the Works which he discovers when reviewing the Contract Documents or in the process of execution of the Works or during the Operation & Maintenance Phase.

4.17.6 The System Integrator shall provide the entire system and facilities on a “single responsibility” basis such that the Contract Price covers all System Integrator’s obligations mentioned in or to be reasonably inferred from this document in respect of the design, manufacture, procurement, construction, installation, adjustment and testing of the Works and remedying any defect therein. This includes all requirements under the System Integrator’s responsibilities for testing and commissioning of the systems and facilities, and where required by this document, the acquisition of all permits, approvals and license, etc.; the training services and such other items and services as may be specified in this document.

4.17.7 The System Integrator shall be responsible for Integration of ATMS system and sub-systems with all third-party solution including any in-house or external solution /mobile application as per as per the requirement raised from time to time by the NWPPL/NEPPL, NHIT, NHAI, Ministry or its authorized agency.

4.18 Scope Matrix

The System Integrator shall execute the work as per the scope mentioned in the respective sections of RFP, the following table represents the scope matrix between client and the System Integrator:

Sl#	Activity		
		NWPPL /NEPPL	System Integrator
1.	Conducting the Site Surveys to assess the feasibility and suitable locations for all ATMS components		✓

Sl#	Activity		
		NWPPL /NEPPL	System Integrator
2.	Approval of the final locations of ATMS components based on the site survey and feasibility report	✓	
3.	Prepare and submission of the Solution Design Document		✓
4.	Approval of Solution Design Document	✓	
5.	Conducting the Factory Acceptance Test (FAT) for all listed components		✓
6.	Construction of building for Traffic Management Center (TMC) along with required facilities to establish the control center of ATMS along with door, window, painting, glass, etc.	✓	
7.	Supply of Interior components and furniture for rooms and blocks of the TMC building	✓	
8.	Supply of Generator and Power Connection and providing the power supply up to the distribution box of TMC building.	✓	
9.	Installation of Conduits & Casing for the Network and Power cables up to each room of the TMC building except Control Center and Server/UPS room	✓	
10.	Supply of Airconditioning and Cooling system for entire TMC Building.	✓	
11.	Interior of Operation room in the Traffic management Centre (TMC) building which may include the supply and installation of the floor mat, wall painting/wall stickers, windows interior, curtains and any other sections of operation room of TMC building.	✓	
12.	Supply and Installation of Illumination (Power Lights) of the TMC building	✓	

SI#	Activity		
		NWPPL / NEPPL	System Integrator
13.	Supply of technical furniture for the operation room of Traffic Management Center along with all required accessories	✓	
14.	Installation of network cables across the entire TMC building, connecting all equipment, workstations, and facilities to the main network switch and necessary sub-network switches.		✓
15.	Power supply infrastructure for all ATMS equipment in TMC Building, including in-room conduit installation and the supply of all essential accessories.		✓
16.	Payment of power connection establishment & recurring cost in TMC	✓	
17.	Supply and Installation of Servo Stabilizer, UPS, Battery Banks, All power Panels, Circuit Breakers, Emergency Lights for Server Room, UPS Room and Operation room in TMC		✓
18.	Supply and Installation of building Fire Safety System, Alarms, along with door, locks, magnet & all required accessories.	✓	
19.	Supply and installation of Smart Access Control System, CCTV Surveillance, Telephone and Intercom for all rooms of TMC building		✓
20.	Supply and Installation of server rack at the designated room with the provision of movable wheel in the racks.		✓
21.	Supply and Installation of Network Related components including Network Switches, OFC patch panels, connector, kits and all other accessories required to enable the network access for all ATMS site and TMC equipment.		✓

SI#	Activity		
		NWPPL /NEPPL	System Integrator
22.	Supply, installation, and configuration of firewall and network security equipment. Develop and implement a comprehensive security policy to safeguard the network and limit access to authorized ATMS users and administrators. Prior approval from client for the network security policy is required before implementation or any amendment.		✓
23.	Supply & Installation of ATMS Primary Server and Secondary Server with redundancy as requirement		✓
24.	Supply & Installation of Video Recording Servers/Network Video Recorders as requirement.		✓
25.	Supply of VMS system, ECB system (if required), VIDES and VASD systems/server in the Server Racks as requirement prescribed in the respective RFP.		✓
26.	Deployment of all requirement Operating System, Database Software, Anti-Virus Software in the server systems.		✓
27.	Deployment of ATMS Application along with required configuration of Incident management, Speed Detection System, enforcement system, configuration utility as requirement prescribed in the respective RFP.		✓
28.	Configuration of Video Server/NVR to add all the ATMS cameras and building surveillance cameras as requirement prescribed in the RFP.		✓
29.	Supply and Installation of Third Party COTS Network Management System (NMS) and Helpdesk & Inventory Management System		✓

SI#	Activity		
		NWPPL / NEPPL	System Integrator
	with configuration of all ATMS devices as requirements prescribed in the respective RFP		
30.	Facilitation of ATMS System Integration with National Informatics Center (NIC) or any other similar department for the enforcement system implementations.	✓	
31.	Integration of enforcement system with NIC or any other similar system, in coordination with all concerned government departments including NIC, Police or any government body required to implement the enforcement.		✓
32.	Providing the RoW to commence the installation of ATMS site Components	✓	
33.	Site Clearance, Construction of Foundation and erection of Gantry and Poles required for the ATMS site components.		✓
34.	Procurement of the ATMS material as per the RFP specification and inviting client for the material inspection		✓
35.	Approval of the Material Inspection report (MIR) for delivered material at site.	✓	
36.	Storage of the ATMS Material before the installation acceptance test.		✓
37.	Transport the material from storage location to site		✓
38.	Installation and Configuration of all ATMS Equipment/system as per RFP specifications		✓
39.	Removal of all debris and other material which is not required after installation from the site.		✓

SI#	Activity		
		NWPPL / NEPPL	System Integrator
40.	Forest and environmental clearances and other local clearances and resolving other similar issues	✓	
41.	Traffic diversion and control during installation		✓
42.	Manpower and machinery required for equipment installation		✓
43.	Supply & Erection of Pole on the Foundation considering the wind pressure of site to provide the stable view of camera view in all weather conditions.		✓
44.	Supply and Installation of Smart Cabinets (Enclosures) on the pole to place the Network Switch, power supply and power back up equipment for TMCS.		✓
45.	Supply and Installation of Solar System along with required stand, clamps and all other accessories for to provide the supply the TMCS as per the requirement prescribed in the respective RFP.		✓
46.	Installation of TMCS Cameras on the pole with required heigh considering strength and all aesthetics.		✓
47.	Network Connection with OFC and Configuration of TMCS cameras setting up the view preset & auto-surveillance pattern as per respective RFP requirements.		✓
48.	Confirm the TMCS functionality with the Control room setup and ensure that there is no blind zone left between two cameras.		✓
49.	Supply and Installation of Network Switches, power backup, cables and all required		✓

Sl#	Activity		
		NWPPL / NEPPL	System Integrator
	accessories required to make the TMCS functional to meet all the RFP Requirements		
50.	Supply & Erection of VIDES Gantry on the Foundations as per the requirement		✓
51.	Supply and Installation of VIDES Smart Cabinets (Enclosures) on the pole to place the Network Switch, LPU, power supply and power back up equipment for VIDES.		✓
52.	Supply and Installation of Solar System along with required stand, clamps and all other accessories for to provide the supply the VIDES as per the requirement prescribed in this respective RFP.		✓
53.	Installation of all VIDES Cameras on the Gantry with required height considering the incident detection and identification.		✓
54.	Configuration of VIDES cameras and for the effective incident management on the site as per the requirement prescribed in the respective RFP.		✓
55.	Installation of ANPR Cameras on the gantry with proper angle to capture & read the number plate of moving vehicles as per the RFP specifications.		✓
56.	Network Connection with OFC and Configuration of VIDES application at site & TMC to ensure functionality as per the RFP requirement.		✓
57.	Installation of Amber Flashing light with integration of VIDES system as per the RFP specifications.		✓
58.	Supply and Installation of Network Switches, power backup, cables and all required		✓

Sl#	Activity		
		NWPPL / NEPPL	System Integrator
	accessories required to make the VIDES functional to meet all the RFP Requirements		
59.	Supply and erection of the gantry for VASD as per the requirements.		✓
60.	Supply and Installation of Smart Cabinets (Enclosures) on the Gantry to place the Network Switch, LPU, power supply and power back up equipment for VASD.		✓
61.	Installation and configuration of Radar system to capture the vehicle speed as per the RFP requirements		✓
62.	Installation of Speed Displays to capture the vehicle speed as per the RFP requirements		✓
63.	Configuration of speed Displays to intimate the live speed to the road user as per RFP requirements		✓
64.	Network Connection with OFC and Configuration of VASD application at Local processing unit & Central level as per the RFP requirements.		✓
65.	Supply and Installation of Network Switches, power backup, cables and all required accessories required to make the VASD system functional to meet all the RFP Requirements		✓
66.	Supply and erection of the gantry for VMS as per the RFP requirements.		✓
67.	Supply and Installation of Smart Cabinets (Enclosures) on the Gantry to place the Network Switch, power supply and power back up equipment for VMS.		✓

Sl#	Activity		
		NWPPL / NEPPL	System Integrator
68.	Installation of VMS on the gantry with proper angle view for all road user as per the RFP specifications.		✓
69.	Network Connection of VMS with OFC and Configuration of VMS application at Central level as per the RFP requirements.		✓
70.	Supply and Installation of Network Switches, power backup, cables and all required accessories required to make the VMS system functional to meet all the RFP Requirements		✓
71.	Network Communication: Planning and Designing the network as per the RFP requirements		✓
72.	Coordination with electricity department, apply for the new connection and get the connection for each location of ATMS site components		✓
73.	Facilitation for the Raw Power supply connection for all field equipment of ATMS.		✓
74.	Payment of power connection establishment up to the Meter installed at the roadside.	✓	
75.	Power connection from roadside meter to all field equipment including cable laying, conduits and all other necessary civil & electrical works		✓
76.	Maintenance of power connection		✓
77.	Trenching or drilling for the OFC duct laying.		✓
78.	Supply and Installation of HDPE duct as per the RFP requirements.		✓
79.	Civil Work related to Chamber construction, covers for chamber and also soil/sand filling in the chamber		✓

Sl#	Activity		
		NWPPL /NEPPL	System Integrator
80.	Backfilling the trench with putting safety/warning tape above the OFC duct as per RFP requirements.		✓
81.	Providing the route markers on every 100 Meters after backfilling the trench,		✓
82.	Supply and Installation of OFC cable using the machineries throughout the highway corridor.		✓
83.	Supply and Installation of all jointer kits, patch panels and all other required accessories to complete the OFC network through the stretch.		✓
84.	Execute the Installation Acceptance Test upon completion of Installation		✓
85.	Execute the System Acceptance Test upon completion all implementation, software and integration of ATMS system.		✓
86.	Closure of SAT punch-points		✓
87.	Providing the Operational Manpower for the incident management at control room as per the requirement	✓	
88.	Providing the technical Manpower for the support and maintenance of ATMS site and TMC equipment as per the RFP requirements.		✓
89.	Execute the preventive Maintenance as per the RFP requirements		✓
90.	Corrective Maintenance to meet all the SLA compliance.		✓
91.	Replace the spare parts as per the RFP compliance		✓
92.	Submission of Daily/weekly/monthly reports to the client.		✓

Sl#	Activity		
		NWPPL /NEPPL	System Integrator
93.	Regular Coordination with Client and status meetings as and when required.		✓
94.	Coordination with external agencies like NIC, traffic police, RTO and other concerned department during the O&M period.		✓
95.	Regular update of Software patches as per the RFP compliances.		✓
96.	Recurring Electricity bills and fuel for generator set for the TMC building.	✓	
97.	Recurring Electricity bills for the Field equipment.	✓	
98.	Necessary approvals from NHAI/state authorities and independent consultants (If any)	✓	
99.	Providing remote connection through VPN for remote access to client or authorized representative.		✓

5 ATMS DESIGN

5.1 ATMS –Detailed Design

The Bidder must design of Advanced Traffic Management System (ATMS) solution in accordance with NHAI/Policy Guidelines/ Standard Documents/2023, Policy Circular No.11.53/2023 dated 10th October 2023

After commencement date of the Works, the Contractor shall submit a Final System Detailed Design to the Client or Its authorized representative for his review and approval. The System Detailed Design shall provide detailed information of the proposed system, including system configuration, block diagrams, input and output, flow charts, interface, inter-connections, design calculation and manufacturer's specification sheets for all systems and shall cover all necessary hardware, software, database and operating procedures. The design of ATMS solution must includes the aspects covered in the below sections:

5.1.1 Software Design

5.1.1.1 Software portion of the System Detailed Design shall include, as a minimum, description of module, identification of tasks, priority level, execution schedule, input and output, algorithms and parameters, database structure and contents, parameter update procedures, data flow, calling sequences, error detection, backup and recovery and programming languages.

5.1.1.2 The structure of software shall be simple and straightforward. Interdependency and interaction between modules shall be clear and kept to minimum to prevent defects in one module from affecting many modules. Data and parameters shall be separate from the program and kept in the database.

5.1.2 Operating Procedures

5.1.2.1 Operating procedures for all systems and equipment of ATMS shall be identified and described in detail in the System Detailed Design. Frequently used operating sequences shall be described in a step-by-step manner.

- 5.1.2.2 Full proof mechanism shall be incorporated in the operation procedure to prevent any inadvertent mistake causing serious damage to the system, highway/expressway operation and driver's safety.

5.1.3 System Configuration

The System Integrator may adopt a system configuration meeting the Authority requirement pertaining to functionality and performance of the system. It is the System Integrator obligation to show that the proposed system will satisfy all the requirements in the system specifications as per the NHAI/Policy Guidelines/Standard Documents/2023, Policy Circular No.11.53/2023 dated 10th October 2023.

5.1.4 Traffic Management Centre System Network

It is required that the Traffic Management Centre server system employs an open network architecture consisting of several servers, operator consoles and central controllers connected through a standard local area network based on TCP/IP. To ensure a high level of reliability and operational flexibility, it is required that the operator console connected to the network complement each other and shall not be dedicated to a specific function. The breakdown of an operator console shall not affect the normal operation of the system in any aspect. Database server shall have a redundant configuration of RAID system or similar highly reliable configuration.

5.1.5 Component Systems

- 5.1.5.1 The ATMS to be constructed on this highway/expressway composes of many component systems as described above. Some of them are closely integrated with other systems. All of them shall be designed with a consistent design policy and concept to achieve the overall objectives of the total system. Functional and performance requirements for each component system are defined in these specifications. The Concessionaire shall undertake the detailed design of each system in such a way that the total system is efficient, reliable and user friendly in operation. The system design shall incorporate the latest technology in each field but propriety technology available from a single vendor only shall be avoided.

- 5.1.5.2 All ATMS equipment shall work 24 hours a day on all days of the year.
- 5.1.5.3 All type of cameras shall support ONVIF profile S/G and shall be FCC Class A, UL, CE, BIS certified. The cameras shall be provided with minimum 128GB internal/local storage (Class 10 or better SD card).
- 5.1.5.4 All Servers, Storage, Computing, LPU, Networking, Security devices etc. shall be BIS certified.
- 5.1.5.5 The MAC (Machine Authentication Code) address of all the equipment shall only be registered in the OEM's name.
- 5.1.5.6 All modules except ATMS Central application shall be third-party COTS (Commercially available off-the-shelf) enterprise edition software and only third-party COTS enterprises edition software shall be provided for the software/ solution/ application / module specified as COTS in the ToR/BOQ and no customized or proprietary software/ module of the Contractor shall be provided for applications such as NMS,FMS,VMS/VAMS, GIS, etc., as approved by Client or Its authorized representative.

5.1.6 **Reliability**

- 5.1.6.1 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.
- 5.1.6.2 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 ATMS Facility Management system (FMS) that shall be continuously maintained for audit by Client or its authorized representative.

5.1.7 **Digital Transmission System**

Digital transmission system for data exchange between field equipment and central equipment shall use IP based transmission system complying with the established international standards such as ITU/ IEEE. All data transfer between the central equipment and the field equipment including video streaming and image shall be made in digital format except the section between local controller and the terminal device. Internet based and wireless transmission

system shall also adopt digital form. In addition, the ATMS shall support communication with Internet of Things (IOT) equipment/systems utilizing the associated standard protocols.

5.1.8 Traffic Management System

The Traffic Management System shall have high reliability, accuracy, and security in design. Failure of the total system shall not be allowed under any circumstances. Redundant hardware configuration shall be adopted for key components to ensure continuous operation. A data backup mechanism shall be used to prevent data loss. An operation log shall be kept to allow tracing of operations in case of any dubious event. The system design shall incorporate mechanisms to prevent illegal or fraudulent activities such as unauthorized access, hacking, data breaches, espionage, DoS attacks, interception of data, session hijacking, malware (viruses, trojans, worms), ransomware, phishing, social engineering, account takeover, identity fraud, packet sniffing, malicious insiders, spyware, keyloggers, data manipulation, and data deletion in the ATMS system and its network infrastructure. The system design should emphasize implementing robust cybersecurity measures, including encryption, firewalls, intrusion detection systems, strong authentication practices, regular audits, and continuous employee training.

5.1.9 Hardware Design Requirements:

The ATMS includes the Hardware comprises of roadside devices and ATMS control center equipment. All the roadside devices shall include the installation of Poles, gantries, enclosure for the setup. The below mentioned section includes the hardware design requirements:

5.1.9.1 Mechanical & 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 /mild steel, 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 therelevant 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 wherever necessary.
10. Further details are included in sections relevant to each type of ATMS equipment.

5.1.9.2 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 $\pm 1\text{mm}$ 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.

5.1.9.3 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 shall be 12 meters. However, some situations may warrant different heights.

5.1.9.4 Tilt/Cantilever Pole/Inverted-L types Gantry for Compact VMS

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, rag 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.
- 15.** An inverted L-type gantry, or cantilever gantry, comprises a single vertical support and a horizontal beam, creating an 'L' configuration. These gantries are to be used for Compact VMS systems (L-type). The cantilever gantry shall comply with the necessary safety and structural strength criteria for VMS installation. A walkway with a minimum width of 600mm along with guard-rails is required to facilitate maintenance of the installed components.

5.1.9.5 Fixed Pole

- 1.** Fixed poles shall be used to mount the:
 - I. TMCS/PTZ Cameras
 - II. Flashing Lights for VIDES.
- 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 thickness of PTZ pole shall be minimum 4 MM and conforming the wind and vibration resistance as mentioned in the functional requirements.
- 6.** The poles shall incorporate suitably designed holes on the sides to allow for electrical cables to enter or exit the pole undamaged.
- 7.** The bottom portion of the pole shall be treated for corrosion resistance in accordance to the installation site.
- 8.** 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.
- 9.** 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.
- 10.** 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.

5.1.9.6 Gantry for VIDES: Inverted 'U' Type along with walkway

- 1.** The gantry shall consist of two vertical support and a single horizontal beam connecting them, forming an "inverted U" shape.
- 2.** The design shall provide stability and suitability for the VIDES equipment.

3. The Inverted-U type gantry shall for each side of road and used for the VIDES installation.
4. The Gantry shall have the enough strength to hold the VIDES Overview cameras, ANPR Cameras, Solar Panels, enclosure and any other required accessories of components to be installed on the gantry. The Gantry must have inner path to pass the required cables.
5. The VIDES gantry shall have the overhead walkway (along with guard rails) of minimum width of **800 MM**.
6. The structural design shall conform to relevant standards and shall be certified by a statutory authority for structural integrity and maximum allowable vibration.
7. The Gantry shall be of stainless steel/galvanized /Enamel Painted/powder-coated to an appropriate minimum coating thickness.

5.1.9.7 Gantry for VASD: Inverted 'U' Type or 'M' type

1. The gantry shall consist of two vertical support and a single horizontal beam connecting them, forming an "inverted U" shape. The Gantry shall have round or square columns for the structure.
2. The design shall provide stability and suitability for the VASD display and radar equipment.
3. The Inverted-U type gantry shall for each side of road and used for the VASD installation. In case of two gantries are at the same location, contractor may merge both gantries as "M" type gantry.
4. The Gantry shall have the enough strength to hold the displays, Solar Panels, enclosure and any other required accessories of components to be installed on the gantry. The Gantry must have inner path to pass the required cables.
5. The structural design shall conform to relevant standards and shall be certified by a statutory authority for structural integrity and maximum allowable vibration.
6. The Gantry shall be of stainless steel/galvanized /Enamel Painted/powder-coated to an appropriate minimum coating thickness.

5.1.9.8 Gantry for M-type VMS: Inverted 'U' Type or 'M' type along with walkway

1. The gantry will consist of two vertical supports and a single horizontal beam connecting them, forming an "inverted U" shape. If Variable Message Signs (VMS) are required to be installed on both sides of the road at the same location, an 'M' type structure may be used.
2. The design shall provide stability and suitability for the M-type VMS considering the strength and stability. The Gantry strength should support the installation of VMS, Solar Panels, enclosure and any other required accessories of components to be installed on the gantry. The Gantry must have inner path to pass the required cables.
3. The VIDES gantry shall have the overhead walkway (along with guard rails) of minimum width of **800 MM**.
4. The structural design shall conform to relevant standards and shall be certified by a statutory authority for structural integrity and maximum allowable vibration.
5. The Gantry shall be of stainless steel/galvanized /Enamel Painted/powder-coated to an appropriate minimum coating thickness.

5.2 Design Review and Approval

- 5.2.1 After commencement date of the Works, the Contractor shall submit a Final System Detailed Design to the Client or Its authorized representative for his review and approval.
- 5.2.2 The Contractor shall submit the System Detailed Design for each component system, including process flow, operation procedures, technical specifications, maintenance procedures, all storage devices, memory details, and sizing details, along with the overall ATMS architecture as per NHAI policy, network architecture, and interface & integration with other systems as per policy and client requirements. The Contractor shall further focus on completing the design of all components to expedite project implementation. If a design change is necessary for the portion of the detailed design that has been submitted and approved due to the design of other portions, a revised detailed design shall be submitted with the modifications noted for approval to be taken from the client.

- 5.2.3 The Contractor shall not, without specific approval in writing by the Client or Its authorized representative, place any material, part or component on order, nor commence manufacturing of any equipment or software coding until the System Detailed Design has been approved by the Client or Its authorized representative. The Contractor shall not implement any changes on the approved system design without prior approval of the Client or Its authorized representative.
- 5.2.4 The approval of the System Detailed Design by the Client or Its authorized representative, however, does not relieve the Contractor from delivering a fully operational and reliable system.

5.3 Sub-Center Component Project

5.3.1 Introduction

Advanced Traffic Management Systems (ATMS) for extensive highway projects section, which exceeds the typical 100 km threshold for a single control center's effective reach, relying solely on a centralized Traffic Management Center (TMC) presents significant challenges. A distributed architecture incorporating one main Control Center and one strategically located Sub-Center is required.

The justification for implementing a Sub-Center on this corridor stems from overcoming the limitations of a purely centralized model:

- I. **Latency:** Transmitting real-time data, especially high-resolution video, over 100 km introduces delays that can impede timely incident detection and response.
- II. **Data Volume & Bandwidth:** The sheer volume of data generated by numerous field devices (cameras, VIDES, sensors) over such a length places immense strain on communication network bandwidth if all data must travel to a single central point. The Sub-Center acts as an intermediate hub, aggregating data locally and reducing long-haul transmission needs.
- III. **Processing Load:** A single central server infrastructure managing all devices across entire length faces a significant computational burden,

potentially leading to performance bottlenecks. Distributing some processing tasks to the Sub-Center alleviates this central load.

Therefore, a Sub-Center is necessary to ensure efficient, responsive, and resilient traffic management.

5.3.2 Functions and Operational Role of the Sub-Center

The Sub-Center will serve as a tactical and operational node focused on its assigned geographic jurisdiction within the corridor. Its key functions include:

- I. **Regional Monitoring:** Providing focused monitoring of ATMS field device status (health, performance) and local traffic conditions within its designated highway segment. Operators gain deeper situational awareness of their specific zone.
- II. **Localized Control:** Exercising tactical control over local field devices based on immediate conditions or directives from the main Control Center. This allows for faster, context-aware responses to local events. Direct access to local camera feeds supports informed decision-making.
- III. **Incident Response Coordination:** Acting as the first point of contact and coordination for incidents detected within its zone. This includes initial verification (often via local camera views), assessment, initiating local response actions (e.g., VMS warnings), and liaising directly with local emergency services and patrol units. This significantly improves response times, supporting the 'golden hour' objective.
- IV. **Data Aggregation & Filtering:** Functioning as an intermediate communication hub, collecting data from field devices, potentially performing initial processing/filtering/compression, and forwarding essential, synthesized information (alerts, summaries) to the main Control Center.
- V. **Load Distribution:** Reducing the computational and operational load on the main Control Center by handling local data processing and monitoring tasks. This enhances overall system performance, responsiveness, and scalability.

- VI. **Disaster Recovery (DR):** Hosting a replicated copy of the central ATMS database to ensure business continuity. If the main Control Center fails, the Sub-Center can potentially take over critical functions, enabled by this replicated data and necessary application interfaces.

5.3.3 Operational Dynamics with the Control Center

The relationship between the main Control Center (TMC) and the Sub-Center is hierarchical yet collaborative:

- I. **Hierarchy:** The TMC provides strategic, network-wide oversight and direction. The Sub-Center operates tactically within its zone according to SOPs and TMC directives.
- II. **Autonomy:** The Sub-Center possesses defined autonomy to execute predefined local control actions and initiate first-level incident responses without explicit central command, ensuring agility. Complex or network-level issues are escalated.
- III. **Data Flow:** Data flows from field devices to the Sub-Center, aggregated/processed data flows from the Sub-Center to the TMC, and commands/updates flow from the TMC to the Sub-Center. Robust communication (typically OFC) is essential.
- IV. **Access Control:** Role-Based Access Control (RBAC) is crucial. Sub-Center operators have access limited primarily to their region's devices and data for monitoring and local control. TMC operators have comprehensive network-wide access and override capabilities.

5.3.4 Core Technical Infrastructure Requirements

The Sub-Center requires dedicated infrastructure:

- I. **Communication Network:** A reliable, high-bandwidth network, typically an OFC backbone with redundancy (e.g., ring topology, diverse routing), is essential for connecting the Sub-Center to the TMC and field devices.
- II. **Monitoring & Control Systems:** High-performance operator workstations with multiple monitors, video wall, local servers sized for data aggregation, potential local processing, and hosting the DR

database replica, and the necessary ATMS software modules shall be required.

- III. **Power Systems:** Highly reliable power is non-negotiable, achieved through a combination of utility feed, adequately sized UPS systems for immediate backup, and a diesel generator (DG) set for extended outages, managed by an Automatic Power Transfer Switch (APTS).
- IV. **Data Management:** Sufficient local storage for data buffering, logs, and the replicated DR database is needed. Mechanisms for managing database replication (synchronous or asynchronous, based on RPO/RTO needs) and monitoring its status are critical.
- V. **Physical Infrastructure:** A secure facility with physical access control, CCTV surveillance, intrusion alarms, appropriate environmental controls (HVAC, fire detection/suppression), and adequate space/layout for operations, equipment, and staff is mandatory.

5.3.5 Operational Advantages

Implementing the Sub-Center offers significant benefits for corridor:

- I. **Improved Monitoring:** Focused regional oversight leads to better understanding of local conditions and enhanced situational awareness.
- II. **Accelerated Incident Response:** Faster local verification and direct coordination with local responders dramatically reduce response times.
- III. **Enhanced Resilience:** The distributed nature limits the impact of local failures. The DR capability provides crucial redundancy against main Control Center failure.
- IV. **Optimized Data Handling:** Reduced data transmission load on the core network and distributed processing load improve central system performance and scalability.

5.3.6 Implementation

Successful implementation requires addressing key challenges:

- I. **System Integration:** Ensuring seamless interoperability between central systems, Sub-Center components, multi-vendor field devices, and DR mechanisms is complex and requires adherence to standards.
- II. **Staffing:** Recruiting, training, and retaining skilled personnel for 24/7 operations, especially in potentially remote locations, is critical and costly. Clear SOPs are essential.
- III. **Maintenance:** Managing maintenance (preventive, corrective, lifecycle) for distributed hardware, software, and backup systems is logistically demanding.
- IV. **Cybersecurity:** The distributed architecture increases the attack surface. A robust, multi-layered security approach (network security, encryption, patch management, monitoring, incident response planning, personnel training) is essential across all sites.

5.3.7 Sub-Center Setup

For the extensive highway project, implementing an ATMS architecture with one Control Center and one Sub-Center is strategically necessary for effective traffic management. The Sub-Center is crucial for overcoming distance-related limitations, enabling rapid local response, enhancing system resilience through load distribution and disaster recovery, and optimizing data handling. Success hinges on careful planning addressing integration complexity, staffing, long-term maintenance, comprehensive cost analysis, and robust cybersecurity measures integrated from the design phase through operations.

6 FUNCTIONAL REQUIREMENTS OF ATMS

6.1 Traffic Monitor Camera System (TMCS)

6.1.1 General:

- 6.1.1.1 The Functional Requirement and Technical specification are in accordance with NHAI/Policy Guidelines/ Standard Documents/2023, Policy Circular No.11.53/2023 dated 10th October 2023 unless otherwise specified in this RFP document. In case of any change or discrepancy, this RFP document shall prevail.
- 6.1.1.2 Traffic Monitoring Control System (TMCS) cameras shall enhance traffic management and road safety. These PTZ cameras capture real-time video footage at 360-degree rotatable view and zoomed up to 500 Meter, enabling the remote monitoring of traffic flow and incident/accident detection.
- 6.1.1.3 This specification of TMCS is the 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.
- 6.1.1.4 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.
- 6.1.1.5 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.
- 6.1.1.6 The PTZ cameras shall be programmed such that they are able to cover 500m in each direction using presets.
- 6.1.1.7 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".

6.1.2 Functional Requirement of TMCS

SL#.	Requirement	Description
6.1.2.1	Video Display	The system shall provide an online display of video images on monitors with latest display technology located in the ATMS Control Centre.
6.1.2.2	System Architecture	The system shall follow an open standard, IP-based network-centric architecture for high-speed performance.
6.1.2.3	Video Processing	The system shall process video signals from various types of CMOS colour cameras installed at road locations for viewing and recording at the ATMS Control Centre.
6.1.2.4	Automatic Event Detection	The system shall automatically detect the following events: a. Accidents (collisions, crashed vehicles, smoke, etc.) b. Parked/Stationary Vehicles
6.1.2.5	Event Detection Latency	The system shall detect and convey events to the ATMS software within 5 seconds of occurrence. Event analytics can be performed at the edge or centrally.
6.1.2.6	Event Response Sequence	Upon event detection: a. The camera shall pause at the event location. b. An audio-visual alarm shall be initiated at the control centre, highlighting the camera view. c. The operator shall assess the situation and take appropriate action: i. Accident: Notify emergency response teams. ii. Stalled Vehicle: Dispatch RPV, zoom in on the number plate, and record evidence for potential action.
6.1.2.7	Video Compression	Video footage shall be compressed using the H.265 better (MPEG-4 Part 10/AVC) standard. The compressed video shall be streamed over the IP network.
6.1.2.8	Camera Type	ATMS setups shall use digital IP cameras only and it should be UTP ready. Existing setups may use analog cameras with external encoders supporting dual streams at 25 FPS. Newer camera technologies can be piloted if they meet the required functionalities.

SL#.	Requirement	Description
6.1.2.9	Encoder Latency and Streams	Encoders shall have less than 200 ms latency and support dual streams - H.265 or JPEG.
6.1.2.10	Recording Resolution	The recording resolution and frame rate shall be user programmable.
6.1.2.11	Power Supply	Cameras shall operate on 230V, 50Hz single-phase power supply. Necessary conversion, if required for devices and its accessories shall be provided along with the Cameras.
6.1.2.12	Encoder Connectivity	Encoders shall be PoE compliant and connected to a Layer 2 or Layer 3 switch using UTP CAT 6 or fiber optic cable.
6.1.2.13	Encoder Specifications	Encoders shall be built on embedded processors with RTOS, converting analog input to digital streams with low latency. They shall support Unicast/Multicast IP packet transmission.
6.1.2.14	Minimum Resolution	The minimum video resolution shall be 4 MP .
6.1.2.15	Encoder Video Standard	Encoders shall generate H.265 or JPEG video streams compliant with ISO/IEC 14496-10. They shall be interchangeable with other encoders meeting ISO/IEC 14496-10 standard.
6.1.2.16	PTZ Camera Functionality	PTZ cameras shall support pre-programmed tours for covering specific points of interest.
6.1.2.17	Additional Surveillance	The system can be used to monitor illegal encroachment, O&M defects, and plantation. A dedicated operator (with civil background) shall be deployed to identify and report defects to Client.
6.1.2.18	Contraflow Detection	If a vehicle is identified driving in the wrong direction for more than 1 km (detected by two TMCS cameras), the command centre shall immediately dispatch an RPV.

6.1.3 Testing Procedure for TMCS

SL#	Requirement	Description
Testing Procedure		
6.1.3.1	TMCS Testing	Manufacturer/Service provider must demonstrate solution viability through: - Previous work of similar capability - Pilot project at the proposed ATMS site

6.1.4 Operation & Maintenance Requirement for TMCS

No.	Requirement	Description
6.1.4.1	Software Integration	Software for operating the CCTV system shall integrate with/export data to and import data from the ATMS unified database at the ATMS Control Centre.
6.1.4.2	Equipment Operability	Equipment shall remain operable for at least the contract period from the date of commissioning.
6.1.4.3	Maintenance and Support	Service provider shall support/maintain and/or provide spare parts until the equipment reaches end-of-life (not less than the contract period from the date of supply).

6.2 Video Based Incident Detection and Enforcement Systems (VIDES)

6.2.1 General

The Functional Requirement and Technical specification are in accordance with NHA/Policy Guidelines/ Standard Documents/2023, Policy Circular No.11.53/2023 dated 10th October 2023 unless otherwise specified in this RFP document. In case of any change or discrepancy, this RFP document shall prevail.

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 generation of e-Challans. The scope of the system includes the following major functionalities:

6.2.2 Detection of accidents/incidents:

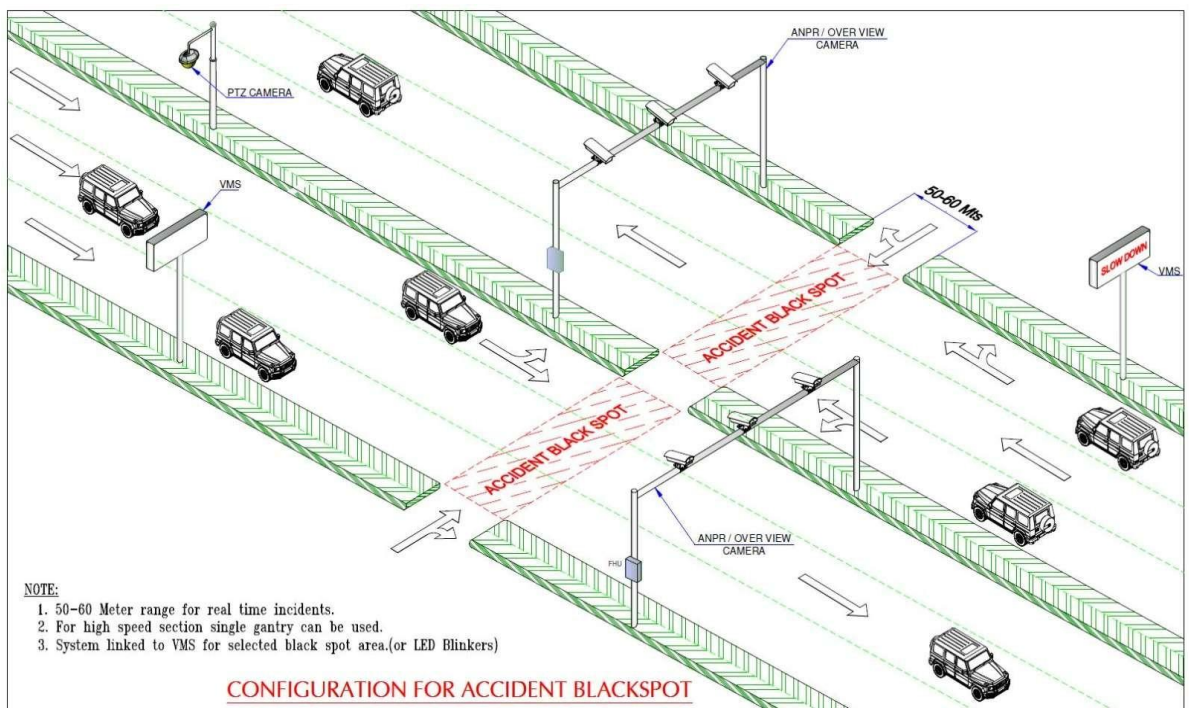
- I. The system should be capable of detecting accidents and incidents that have the potential to cause accidents.
- II. Incidents/Accidents so detected shall have the following uses:
 - a) It should capture evidence to facilitate the generation of e-Challans, discouraging such unsafe behavior.
 - b)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

6.2.3 Automatic Traffic Counting & Classification: The system should have the ability to automatically count and classify traffic, providing valuable data for traffic management purposes.

6.2.4 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.

- 6.2.4.1 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.
- 6.2.4.2 Overview camera(s) to cover all lanes in each direction.
- 6.2.4.3 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.

6.2.4.4 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.

6.2.5 Functional Requirements of VIDES:

SL#	Requirement	Description
6.2.5.1	System Components	- Gantry-mounted cameras connected to co-located or centralized/cloud video processing. - Automatic incident detection and alarm triggering (VMS/Lights/App/Command Centre). - Components: Video Image processing unit(s) Overview Camera: (60-100m viewing with IR/Thermal night vision) ANPR Camera : low-angle with IR illuminator Pole/gantry mounted Flashing warning lights/VMS Surge Suppressor Audio/Visual Alerts for Command Centre Operator Back-office software for violation validation and integration with enforcement agency (E-challan and Vahan). All other necessary operational equipment.
6.2.5.2	Automatic Incident Detection	- Automatically detect incidents using video analytics (as specified in section 6.2.7).
6.2.5.3	Camera Setup	- ANPR camera(s) facing traffic, covering all lanes .

SL#	Requirement	Description
		- Overview camera(s) with 60-100m view in each direction, covering all lanes day and night.
6.2.5.4	Camera Placement and Optimization	- One ANPR camera per lane, - Overview camera(s) to cover all lanes in each direction (Front and Rear). - Setup can be modified as long as functional requirements are met. - Minimize the number of components while maximizing utilization and multi-functionality. - Any Deviations from the typical setup, shall require Proof of Concept (POC) and Employer approval.
6.2.5.5	Incident and Number Plate Capture	- Cameras positioned to detect incidents in both directions across all lanes. - Capture number plates for all vehicles passing under the gantry.
6.2.5.6	VIDES Coverage	- One VIDES system comprises LHS and RHS Gantries. - LHS and RHS gantries can be positioned separately but within 500 meters for optimal blackspot coverage.
6.2.5.7	Local Incident Warning	- Activate flashing lights/LED blinkers and/or display incident messages on VMS upon incident detection.
6.2.5.8	VMS for Critical Locations	- VMS shall be used for alarms and warnings instead of flashing lights at MORTH Blackspots or high-risk accident spots.
6.2.5.9	Communication to ATMS Control Centre	- Detected incidents communicated to the ATMS Control Centre.
6.2.5.10	Incident Broadcasting	- ATMS Control Centre broadcasts incident location and type to RajMarg Yatra API. - Update Rajmarg Yatra when the incident is no longer active. The SoP to update the Rajmarg Yatra App
6.2.5.11	Incident Recording	- Record selected incident types (recording of entire incident duration including minimum 10 seconds prior and after of the incident). <u>Store recordings:</u>

SL#	Requirement	Description
		- 180 days or until SLAs are assessed (whichever is larger) - Entire contract period for accidents - For Enforceable challans, 60 days or Until data transfer to local authority whichever is letter.
6.2.5.12	Remote Viewing and Recording	- Online View and record Video camera images at the ATMS Control Centre.
6.2.5.13	Flashing Lights	- Gantry/Pole mounted flashing lights (300mm diameter, 500m visibility) for local warnings where VMS is not used.
6.2.5.14	Warning Light/VMS Placement	- At least two warning lights/VMS, typically at 200m and 300m before the incident monitoring point.
6.2.5.15	VMS Programming	- Programmed to display appropriate messages for each incident as per the technical and functional requirement of VMS.
6.2.5.16	Interconnection	- LED blinkers interconnected with the incident detection system either through cable or wireless.
6.2.5.17	Poor Visibility Operation	- Flashing lights activated during poor visibility until conditions improve.
6.2.5.18	Flashing Light Deactivation	- Stop flashing when the incident disappears or upon reset from the control room.
6.2.5.19	Video Wall Display and Alarms	- Display all VIDES overview feeds on the video wall. - Audio-visual alarms in the Command Centre for detected incidents.
6.2.5.20	Offline Functionality	- VIDES functions locally during intermittent internet connectivity. - Automatically sends data to ATMS Control Center for processing when connectivity is restored.
Video Image Processing Unit		
6.2.5.21	Combined Functionality	The Video Image Processing Units shall be locally installed to monitor traffic flow monitoring and automatic incident detection.
6.2.5.22	System Design	The system shall be modular and multi-functional.

SL#	Requirement	Description
6.2.5.23	Vehicle Detection	The Video Image Processing Unit, coupled with the overview camera, shall detect the presence of vehicles in the entire field of view of the Camera.
6.2.5.24	Centralized processing (If Required by Client)	In addition to local processing, if client requires the incident detection at centralized location (command center or cloud): - Inference time must be < 2 seconds. - Centralized software must connect to local warning lights/VMS. - Incidents shall be processed post-facto if internet connectivity is lost.
Flow Monitoring		
6.2.5.25	Flow Detection	The system shall be able to distinguish between minimum 5 types of traffic flows (levels of service) based on flow speed and zone occupancy.
ATCC Functionality		
6.2.5.26	Traffic Counting and Classification	ANPR cameras monitoring each lane shall be used for Automatic Traffic Counting and Classification (ATCC).
6.2.5.27	Vehicle Recording and Classification	Each vehicle passing under the gantry shall be recorded and classified by the ANPR camera.
6.2.5.28	Vehicle Classification Categories	Indicative vehicle classification for ATCC: 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 g) Any other classification declared by the Authority/Client.
6.2.5.29	Vehicle Classification for Other Purposes	ANPR cameras shall classify vehicles for speed violation and other incident detection purposes.

SL#	Requirement	Description
6.2.5.30	Data Storage	Vehicle-wise traffic data (Vehicle Type, Number Plate, Date/Time) from each gantry shall be stored in a relational database at the command center for 180 days or until SLAs are assessed, whichever is longer. Photos shall be stored for all the transactions.
6.2.5.31	Data Sharing and Comparison	Data shall be shared with Client/NHAI/IHMCL for comparison with NPCI toll collection data to identify the vehicles on the stretch whose transaction data is not found/matched with respective Toll plaza.
6.2.5.32	Vehicle Class Verification	ATMS software shall identify vehicles whose class (identified visually) doesn't match the class from the NPCI FASTag mapper API and report these discrepancies to Client.
Speed Detection		
6.2.5.33	Speeding Detection Types	- Detect both spot speeding and section-based speeding (day and night). - Spot speeding: estimate vehicle speed at the gantry location. - Section-based speeding: calculate average speed between two VIDES gantries (typically every 10 km).
6.2.5.34	Compliance with Guidelines	- Speed violation detection technique should align with MORTH and Traffic Police guidelines and notifications.
6.2.5.35	Accuracy and Speed Range	- 98% accuracy in speed detection. - Capture speeds up to at least 180 kmph for all vehicle types (day and night).
6.2.5.36	Speed Detection Technology	- Employ visual speed detection (using cameras) or other sensors (e.g., radar) based on functional and economic considerations.
6.2.5.37	Vehicle Differentiation	- Differentiate and measure speeds of multiple vehicles even in challenging conditions (parallel driving, tailgating, crowding etc.). - Measure speeds for more than 90% of vehicles passing under the gantry.

SL#	Requirement	Description
6.2.5.38	Evidence Quality	- 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.
6.2.5.39	Variable Speed Limits	- Enforce separate speed limits for different vehicle types. - Obtain specific speed limits for the stretch from Client.
6.2.5.40	Section-Based Speeding Calculation	- Calculate average speed using timestamps and distance between gantries. - Capture license plates of all vehicles for section-based speeding. - Issue eChallans for vehicles exceeding the prescribed speed limit for particular vehicle type at respective highway stretch.
6.2.5.41	Calibration and Conformance	The speed enforcement mechanisms shall be calibrated to the satisfaction of the local enforcement stakeholders (Traffic Police etc) and conformance to 167 A of Motor Vehicle Act.
Incident Detection		
6.2.5.42	Alarm Outputs and Image Capture	- Define outputs for each alarm. - Field modules save images in case of alarm and send them to the ATMS Control Centre server. - Image sequence includes pre- and post-incident information. - Provide alarms for: a) Video quality bad/low b) No video signal c) Communication problem
6.2.5.43	Local Incident Storage	- Save incidents on the local field module during communication problems with the central server.
6.2.5.44	Data Clearing	- Central server clears data on the local module after successful transfer.
6.2.5.45	Combined Functionality	- Video Image Processor-Incident Monitor combines incident detection and traffic flow monitoring in a single module.

SL#	Requirement	Description
6.2.5.46	Alarm Configuration	- Enable/disable alarms for specific traffic flow types (e.g., no stopped vehicle alarms during queues).
6.2.5.47	Camera Calibration	- Calibrate each camera for the specific scene (lanes, junctions, etc.).
6.2.5.48	Remote Updates	- Continuously update cameras with improved AI models and new incident types(if required by the client) remotely without physical changes in the setup.

6.2.6 Testing and O&M Requirements

Testing Requirement		
6.2.6.1	Testing Requirement	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.
Operation and Maintenance Requirements		
6.2.6.2	Control Room Operation	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.
6.2.6.3	Equipment life	The equipment supplied shall remain operable for the contract period from the date of successful completion of SAT.

6.2.6.4	Maintenance scope	The Service provider shall undertake to support/maintain the equipment till the completion of the contract period.
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6.2.7 Type of Incidents:

The VIDES (combination of ANPR and Overview) cameras will work in tandem to cover the incidents and enforcements listed below:

Incident	Incident Name and Description	Proposed Primary Camera	Precision & Recall	Actionables/ SLRs
Accidents Detection	Collisions of vehicles, vehicles ramming into side rails, medians, vehicles with smoke/fire coming etc. <i>Real-time Detection & Alert</i> (Day and night)	Overview	97% Recall 90% Precision	RPV & Ambulance Dispatch Automated Message to VMS Automated Flashing Video to be saved.

Incident	Incident Name and Description	Proposed Primary Camera	Precision & Recall	Actionables/ SLRs
Contraflow/ Opposite Side traffic Violation	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. <i>Real-time Detection & Alert</i>	ANPR/ Overview	90+ Recall 90+ Precision	eChallan VMS Flashing Video to be saved.
Stalled or Stationary Vehicles	Detection of stationary vehicles within 5sec <i>Real-time Detection & Alert</i>	Overview	90% Precision 90% Recall	eChallan RPV Dispatch Flashing Light VMS Message: Caution: Parked Vehicles Ahead Video to be saved.
Fog & Low Visibility	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

Incident	Incident Name and Description	Proposed Primary Camera	Precision & Recall	Actionables/ SLRs
Fallen Objects	Detection of debris/fall objects of size that can impact traffic or road safety. Real-time Detection & Alert	Overview	90% Precision 90% Recall	RPV Dispatch Flashlight VMS Caution: Drive Slowly Debris on Road
Pedestrian	Pedestrian Crossing <i>Real-time Detection & Alert</i>	Overview	90% Precision 90% Recall	Flashing Light VMS: Caution: Drive Slowly Pedestrian Crossing.
Cattles/Animal Movement	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 Violation	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.

Incident	Incident Name and Description	Proposed Primary Camera	Precision & Recall	Actionables/ SLRs
Seatbelt Violation	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.
Without Helmet	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.
Tripple Riding	Triple Riding in Two Wheelers <i>Real-time not necessary (back-office processing permitted)</i>	ANPR	90% Precision 90% Recall	eChallan Video to be saved.
Two-Wheeler Detection	Two Wheeler or other Banned Vehicles on Expressway/Highway (if any) <i>Real-time Detection & Alert</i>	ANPR	95% Precision 95% Recall	eChallan Video to be saved.

Incident	Incident Name and Description	Proposed Primary Camera	Precision & Recall	Actionables/ SLRs
Over speeding	Over-speeding detection <i>Real-time Detection & Alert</i> Detailed in Below	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.
Congestion	Traffic Flow <i>Real-time not necessary (back-office processing permitted)</i>	Tandem		Analysis/ Messaging

6.3 Vehicle Actuated Speed Display

6.3.1 General

- 6.3.1.1 The Functional Requirement and Technical specification are in accordance with NHAI/Policy Guidelines/ Standard Documents/2023, Policy Circular No.11.53/2023 dated 10th October 2023 unless otherwise specified in this RFP document. In case of any change or discrepancy, this RFP document shall prevail.
- 6.3.1.2 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 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.
- 6.3.1.3 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.

6.3.2 Functional Requirement of VASD

SI#	Functional Requirement	Description
6.3.2.1	Operational Capability	System shall function effectively in various conditions in Day, night, and adverse weather
6.3.2.2	Self-Diagnostics	Built-in diagnostics to assess speed calibration
6.3.2.3	Display Adjustment	Automatic display intensity adjustment Based on ambient light conditions
6.3.2.4	Construction	Modular design For ease of maintenance

SI#	Functional Requirement	Description
6.3.2.5	Speed Display & Warning Sign	Support Display of numeric speed data Display warnings Graphical (standard IRC road warning signs preferred) or textual
6.3.2.6	Speed Measurement Range	1 km/h to 200 km/h
6.3.2.7	Measurement Accuracy	Up to 100 km/h: ± 3 km/h Above 100 km/h: ± 5 km/h
6.3.2.8	Minimum Monitored Distance	90 m

6.3.3 Testing and Installation Requirements

Testing and Installation Requirements		
6.3.3.1	Speed Limit Programming	Verify speed limit can be programmed using provided software over the network or via a locally connected laptop.
6.3.3.2	Display and Sensor Performance	Test brightness of pixels, ambient light sensor functionality, radar accuracy, and occurrence of false positives.

6.3.4 Operation & Maintenance Requirement for VASD

No.	Requirement	Description
6.3.4.1	Software Integration	Software for operating the VASD shall integrate with/export data to and import data from the ATMS unified database at the ATMS Control Centre.
6.3.4.2	Equipment Operability	Equipment shall remain operable for at least the contract period from the date of commissioning.
6.3.4.3	Maintenance and Support	Service provider shall support/maintain and/or provide spare parts until the equipment reaches end-of-life (not less than the contract period from the date of supply).

6.4 Variable Message Sign (VMS)

6.4.1 General

The Functional Requirement and Technical specification are in accordance with NHA/Policy Guidelines/ Standard Documents/2023, Policy Circular No.11.53/2023 dated 10th October 2023 unless otherwise specified in this RFP document. In case of any change or discrepancy, this RFP document shall prevail.

The Variable Message Signs (VMS) shall be installed at the designated locations. The VMS shall be used for providing advance travelers information and highway condition to the users and shall be controlled by the ATMS Control Centre.

VMS is one of the important and effective electronic tools to manage traffic in response to road incidents, special events, travel warning, congested situation, travel time, accidents, road work, lane restrictions, and construction or maintenance activities on the highway.

There shall be total **02 types** of VMS to be used:

1. Type 1 – Fixed VMS:

- I. Full VMS shall be mounted on Inverted U-shaped gantry.
- II. Compact VMS: Compact VMS shall be mounted on L-shaped gantry / cantilever structure.

2. Type 2 – Portable VMS or trolley VMS

6.4.1.1 A Typical fixed VMS shall consist of the set of following sub-components:

- 1.** VMS Display with integrated housing
- 2.** Mounting Infrastructure
- 3.** VMS application with integration to the ATMS Control Centre Software.
- 4.** Field Network Switch (as per the design of ITS Contractor)
- 5.** Solar powered hybrid UPS
- 6.** Junction Box including Lightning and Surge Protection Device
- 7.** Cabling and Earthing (including Lightning arrester)

6.4.1.2 A typical portable VMS shall contains the following:

- 1.** Trolley Set along with Wheels
- 2.** Display panel with enclosure
- 3.** Controller
- 4.** GPRS/WIFI/Ethernet/OFC based Communication Unit
- 5.** All Cables and accessories Required

6.4.2 Functional Requirement of VMS

SL#	Functional Requirement	Description
6.4.2.1	Effective Messaging	Messages shall: I. Fulfill functional requirements II. command a short-span but definite attention. III. Convey clear and concise information IV. Elicit a desired driver response V. Be displayed with adequate time for driver response
6.4.2.2	Display Procedure	The display procedure shall: I. Ensure message accuracy is authenticated. II. Maintain message relevance by monitoring incidents and updating the display III. Maintain and ensure information credibility
6.4.2.3	Message Management	Procedures for posting, altering, and deleting messages interactively to ensure message relevance and credibility.
6.4.2.4	User Interface	Intuitive user interface for system operation and management
6.4.2.5	Construction	Modular design for ease of maintenance
6.4.2.6	Display Capabilities	Sufficient graphics capability to display:

SL#	Functional Requirement	Description
		- Multi-lingual messages (English, Hindi, and local language) - Standard IRC road signs
6.4.2.7	Module Replacement	Modules shall be field replaceable
6.4.2.8	Legibility	Display legible from at least 250 meters of distance
6.4.2.9	VIDES Integration	Integration with adjacent VIDES for automated messages for specific incidents/accidents
6.4.2.10	Mounting (Fixed VMS)	Mounted on a sturdy and aesthetically pleasing gantry structure with at least 5.5m vertical clearance from the road
6.4.2.11	Safety Barriers	Safety barriers at gantry support columns for protection
6.4.2.12	Wind Load Capacity	Structure capable of bearing wind loads up to 200 kmph

6.4.3 Operation & Maintenance Requirement for VMS

No.	Requirement	Description
6.4.3.1	Software Integration	Software for operating the VMS shall integrate with/export data to and import data from the ATMS unified database at the ATMS Control Centre.
6.4.3.2	Diagnostics and Logging	The VMS and its sub-systems shall: - Perform self-tests/diagnostics regularly and on request. - Log events and problems for each individual equipment. - Automatically flag problems at the ATMS control center. - Log problems in the ATMS server.
6.4.3.3	Operability Period	The equipment shall remain operable for at least the contract period from the date of commissioning.
6.4.3.4	Support and Maintenance	The service provider shall provide support and maintenance for the VMS until the completion of the contract period.

6.5 ATMS Control Centre with ATMS Software

6.5.1 Control Center Systems

The Functional Requirement and Technical specification are in accordance with NHA/Policy Guidelines/ Standard Documents/2023, Policy Circular No.11.53/2023 dated 10th October 2023 unless otherwise specified in this RFP document. In case of any change or discrepancy, this RFP document shall prevail.

The Control Centre shall accommodate following equipment and software:

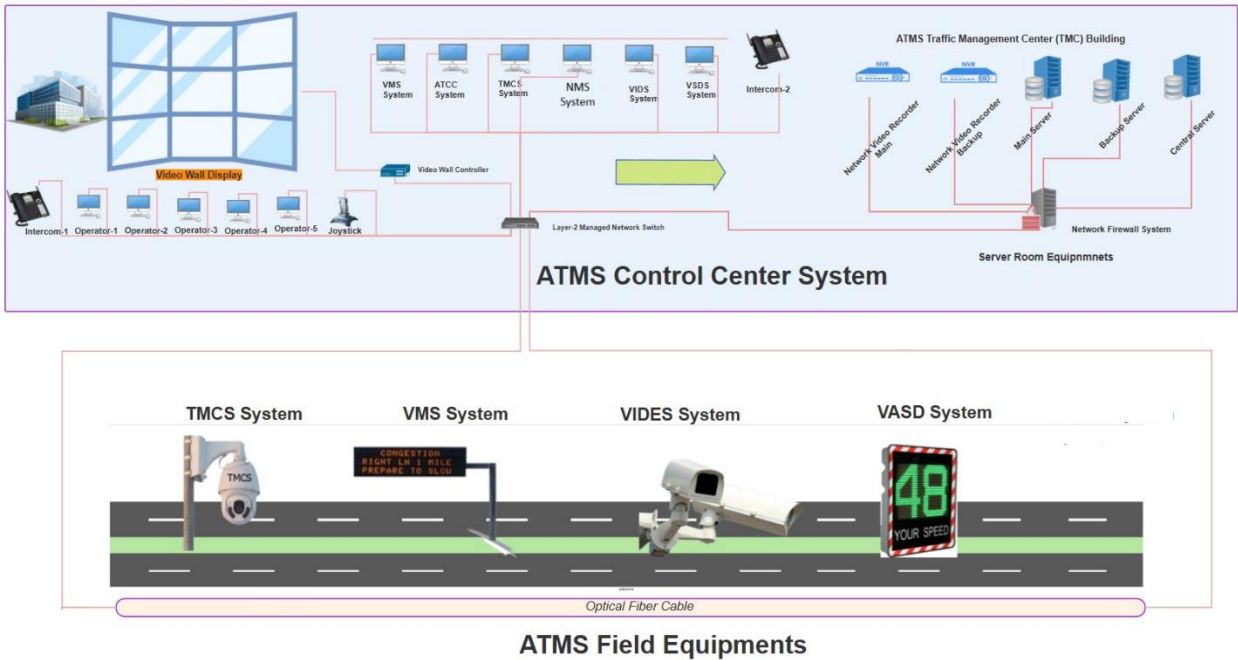
- 1.** Central Computer Server (with integrated ATMS Software including the traffic Management and Rescue module, integrated audio communication unit & support for relevant Mobile smartphone applications)
- 2.** Emergency call management system equipment and software
- 3.** Integrated Traffic Management (ITM) console consisting of mainly the ITM workstation(s), the Integrated audio communication unit and further
- 4.** Integrated with the
 - I. Large Display Board based on the Video-wall 3 x 2 meters
 - I. CCTV Console,
 - II. VIDES console and Dedicated Video-wall (Minimum 75" Smart TV)
 - III. other equipment
- 5.** ATMS Central software
- 6.** Backbone communication equipment and Network Management System for the same
- 7.** Printers for control centers
- 8.** Uninterrupted Redundant Power Supply with supply system and back up.
- 9.** Firewall, IDS, IPS and other network security component and critical systems such as servers, storage etc.
- 10.** TMC Central Processing Servers in hot standby configuration (Primary + Secondary)

- 11. Backup Video Recording (Only Incidents) Server with adequate inbuilt storage and hot standby.

6.5.2 ATMS Control Center 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.

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6.5.2.1 **Communication medium and Infrastructure**

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.
1. 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.
 - I. ATMS Control Centre Internal Cabling – combination of Multimode FO and cat-5E or cat-6 Ethernet
 - II. 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.
 - III. 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.

6.5.2.2 **Control Room Building (under Client Scope)**

1. Control Room building 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.
2. 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.
3. It shall be provided with appropriate Fire detection, alarm and Fire extinguishing systems.

4. It shall be provided with a suitable access control system.
5. It shall provide adequate Toilet / washroom facilities for the personnel and visitors.
6. The Power supply equipment (generator, UPS etc.) may be housed in an adjacent cabin suitable for the same

6.5.3 Functional Requirements of ATMS Control Center

Sl#.	Functional Requirement	Description
6.5.4 General Requirement		
6.5.4.1	System Scalability	Each System and sub-system must be designed to accommodate at least 10 years of projected traffic growth from the time of installation.
6.5.4.2	System Expandability	Each sub-system must be expandable by at least $\pm 25\%$ (rounded up to the nearest whole number) to handle fluctuations in the number of field devices.
6.5.4.3	Power Supply and Backup	All Control Centre equipment must operate on 230V, 50Hz single-phase power supply with online UPS backup of at least 4 hours or more. Necessary voltage/frequency conversion devices must be included if required.
6.5.4.4	Equipment Racking	All control Center equipment (servers, NVRs, etc.) must be housed in standard racks.
6.5.4.5	Remote Connectivity	The system must support WAN/5G connectivity for remote monitoring.
6.5.4.6	Data Backup	Online backups must be implemented to prevent data loss due to storage failures.

SI#.	Functional Requirement	Description
6.5.4.7	Technical Documentation	The system provider must provide Client with comprehensive technical details about data formats, communication protocols, and packet formats.
6.5.4.8	Software Accessibility and Security	All sub-system software modules should be accessible from all workstations, but with role-based access control to ensure security and limited functionality based on user group.
6.5.4.9	Alert and Event Reporting	All sub-systems must generate and report alerts for predefined events, including safety-related, equipment-related, and operational events. These alerts must also be communicated to the Traffic Management consoles.
6.5.4.10	System Reporting	The system must provide detailed reports on system operations, maintenance, and incident management. The report format will be finalized in consultation with Client.
6.5.4.11	Incident Logging and Reporting	The system must automatically log and report highway incidents based on data from field equipment and sensors.
6.5.4.12	User-Formatted Reports	The system must allow users to generate custom reports that combine incident data, sensor values, and equipment status on a common timeline.
6.5.5 ATMS System Security		

SI#.	Functional Requirement	Description
6.5.5.1	Role-Based Access Control (RBAC)	The system shall implement RBAC to control the access to functions and sub-functions (menus, submenus, buttons) based on user groups. Project Manager/Administrator shall have granular control at the user level.
6.5.5.2	Access Levels	Access control shall have three levels: Read, Write, and Modify. Users/user groups can be assigned any combination of these access levels for specific functions.
6.5.5.3	Manual Override Control	Manual override options shall be treated as separate functions and can be disabled for any user/user group by denying access.
6.5.5.4	Access Rights Documentation	A detailed list of access rights will be defined during the detailed engineering phase.
6.5.5.5	Session Logout	User logout shall be recorded in the database at the end of each session.
6.5.5.6	Single Instance per Workstation	A new user shall not be able to log in to the application on a workstation until the current user logs out.
6.5.5.7	Administrator-Controlled Exit	Exiting the application shall require administrator authentication (username and password).
6.5.6 Traffic Monitoring and Incident Management		
6.5.6.1	Supervisory Monitoring & Control System	A Supervisory Monitoring & Control System with Digital Video Surveillance Control Software shall manage all video surveillance devices.

SI#.	Functional Requirement	Description
6.5.6.2	System Components	The system shall include a Camera Switcher controller, Joystick, Camera server, NVR, and adequate workstations (CCTV & VIDES). It shall provide streaming video to Video Walls, monitors, and workstations.
6.5.6.3	Device Support	The software shall support various devices, including PTZ, fixed, and VIDES cameras, video encoders/decoders, PTZ controllers, NVRs, and NAS/RAID backup devices.
6.5.6.4	Manufacturer Qualifications	The manufacturer of the CCTV Switcher Controller/NVR/Camera Server shall be a well-known company with a local presence, capable of providing 24/7 after-sales service and support.
6.5.6.5	Open Architecture	The software shall operate on an open architecture and integrate with other subsystem software (VMS, WIM, Speed Display, Roadside Communication, etc.).
6.5.6.6	Device Configuration Management	The software shall store and manage the configuration of encoders, decoders, and cameras, with the ability to generate reports.
6.5.6.7	Alarm Management	The software shall provide alarms and an alarm logs. Alarm settings shall be configurable per alarm and camera, with pre-record durations ranging from 2 seconds to 5 minutes. The system shall allow filtering, printing, and displaying of the alarm logs.

SI#.	Functional Requirement	Description
6.5.6.8	User Management	The administrator shall be able to create, edit, and delete users, and manage their access rights to system resources, functionality, and cameras.
6.5.6.9	User Hierarchy	The system shall support a user hierarchy with at least three levels. Higher-priority users shall inherit the rights of lower-priority users when taking control of cameras.
6.5.6.10	Audit Trail	The system shall maintain a user activity log with user ID, timestamp, and actions performed.
6.5.6.11	Video Walls and Monitors	Video walls with suitable mounting arrangements shall be set up for monitoring purposes. Additional CCTV monitors (HDMI, RGB, IP-based) shall be provided for viewing and controlling cameras at various locations.
6.5.6.12	Centralized Monitoring and Control	The ATMS Control Center shall monitor and control the surveillance area through workstations and joystick controllers using the Digital Video Surveillance Workstation Frontend Software.
6.5.6.13	Browser-Based Access	The Workstation Frontend Software shall support browser-based access for authorized remote users (including Client office/ NHAI HQ, PD/RO, and Traffic Police) to view and control cameras.
6.5.6.14	Display Modes	The software shall support flexible split-screen display modes (1/2/4

SI#.	Functional Requirement	Description
		windows) and scroll mode on PC monitors and preview monitors.
6.5.6.15	Camera Control	The software shall provide comprehensive camera control, including PTZ, iris control, focus, color balance, presets, and video tours.
6.5.6.16	Temporary Access Control	Users shall be able to request temporary access to view or control cameras outside their normal permissions.
6.5.6.17	Multi-Operator Support	The ATMS Control Center shall support simultaneous camera control by multiple operators.
6.5.6.18	Programmable Recording Settings	Recording resolution and frame rate shall be user-programmable for each camera.
6.5.6.19	Recording Modes	The system shall support continuous, manual, and programmed recording modes, configurable per camera or group of cameras. It shall allow searching, replaying, and scheduled recording, with different recording speeds and resolutions for each mode and camera.
6.5.6.20	NVR/Camera Server	The NVR/Camera Server may be embedded, server-based, or cloud-based, running on off-the-shelf servers. Each server shall handle at least 36 cameras or more.
6.5.6.21	Video Stream Management	The NVR shall manage video streams and storage, with programmable recording frame rate and resolution for each channel.
6.5.6.22	Tamper-Proof Recording	The system shall ensure the integrity of recorded video, preventing

SI#.	Functional Requirement	Description
		alteration and maintaining an audit trail for evidential purposes.
6.5.6.23	Storage Capacity and Retention	The system shall store all camera recordings for at least 180 days or until SLAs are assessed, whichever is longer. Storage capacity shall be sufficient for 25 FPS, 2 MP (or 4 MP, as applicable) video quality with compression, considering a 25% camera capacity extension.
6.5.6.24	Watermarking and Digital Certificates	The system shall support watermarking or digital certificates to ensure tamper-proof recordings for evidential purposes.
6.5.6.25	Recording Metadata	All recordings shall include programmable Camera ID, location/area, and date/time stamp.
6.5.6.26	Recording Frame Rate Options	The system shall support recording in real-time (25 FPS) and lower frame rates (15/12.5/10 or lower) in any combination.
6.5.6.27	Recording Resolution Options	The system shall support recording in 720p/1080p or any combination, allowing selective or group-based recording quality.
6.5.6.28	Video Compression and Streaming	Video shall be compressed using MPEG-4, H.265 or better and streamed over IP networks. It shall be viewable on workstations, remotely over the internet, or on analog monitors via decoders. Recordings shall be stored on NVR/Camera Servers and backed up on NAS/RAID devices.

SI#.	Functional Requirement	Description
6.5.6.29	Triplex Operation	The system shall support simultaneous viewing, recording, and replaying of video.
6.5.6.30	Video Retrieval and Export	The system shall allow retrieval, export, and backup of video clips to various media (Pen Drive, External HDD, CD, DVD, etc.). Viewing of exported recordings shall be possible on standard PCs using common software. An activity log shall be maintained for audit purposes.
6.5.6.31	Redundancy and Failover	The system shall provide redundancy and failover capabilities. In case of NVR/Camera Server failure, cameras shall automatically switch over to a redundant server.
6.5.6.32	Database Server	The Database Server shall track configurations, error data, configuration events, usage events, and error events.
6.5.6.33	Video Archiving	Video streams shall be recorded on respective NVR/Camera Servers and archived to NAS/RAID backup devices.
6.5.6.34	Scripting/Algorithms	The application shall include necessary scripts/algorithms for video archiving and management.
6.5.6.35	Workstation Access	All workstations on the LAN shall have software to view, control cameras and encoders, and retrieve recorded video from NVR/Camera Server/NAS/RAID devices.
6.5.6.36	Dedicated Workstation for Enforcement	A dedicated workstation shall be provided for Traffic Police or other enforcement agencies.

SI#.	Functional Requirement	Description
6.5.6.37	VIDES Integration and Functionality	The system shall integrate with VIDES, allowing switching and viewing of video streams from VIDES cameras on CCTV monitors, VIDES Video Wall, and workstations. The VIDES supervisory software shall determine following: traffic parameters: Volume, occupancy, classification, flow rate, headway, speed level of service, space occupancy, Traffic Density Other Incidents as defined in the functional requirement of VIDES.
6.5.6.38	Violation Verification and Vaahan Database Integration	The VIDES software shall integrate with the Vaahan database for eChallan generation. Violations detected automatically, primarily through VIDES (Overview and ANPR) or manually (RPVs, TMCS cameras) shall be registered. Such violation shall be registered only upon authorization from the Manager. Each violation shall have the necessary evidence and data for eChallan generation.

SI#.	Functional Requirement	Description
		The system shall allow manual verification and editing of number plates captured by ANPR, with audit trails for all edits.
6.5.7 Video Wall at Control Centre		
6.5.7.1	Video Wall Layout	The video wall controller shall support various monitor matrix geometries, although a 3x3 configuration is typical.
6.5.7.2	Video Wall Dimensions	The typical video wall display size shall be 3x2 meters or more.
6.5.7.3	Video Wall Input Sources	The video wall controller shall capture and display video from DVI, DisplayPort, VGA, and IP streaming sources.
6.5.7.4	Monitor Bezel Size	Monitors used in the video wall shall have bezel edge sizes less than 6 mm .
6.5.7.5	Integrated Video Wall Package	The video wall shall be an integrated package including control room display management software, a display controller (capable of handling at least 48 monitors), and slim bezel monitors.
6.5.7.6	Hot-Plugging and Redundancy	The video wall system shall support hot-plugging of monitors and have built-in redundancy.
6.5.7.7	Auto Calibration and Color Balancing	The video wall controller shall support automatic calibration and color balancing.
6.5.7.8	Monitor Mounting	Monitor mounts shall allow for easy replacement and hot-plugging.

SI#.	Functional Requirement	Description
6.5.7.9	Manufacturer Qualifications	The video wall manufacturer shall be a well-known company with a local presence, capable of providing 24/7 after-sales service and support.
6.5.7.10	Image Resizing and Positioning	Images displayed on the video wall shall be freely resizable and re-positionable.
6.5.7.11	Multi-Display as Single Screen	The video wall shall support multiple displays arranged in rows and columns, functioning as a single logical screen.
6.5.7.12	Dedicated VIDES Video Wall	A separate video wall with a minimum 75" smart TV shall be provided for VIDES.

6.5.1 Technical Specification of ATMS Software

SI#	Requirement	Specification
6.5.2 General Requirements for ATMS Software		
6.5.2.1	System Integration	The ATMS software shall integrate field equipment (CCTV cameras, VIDES, VMS) with the Integrated Traffic Management (ITM) console for effective traffic monitoring and incident/accident management.
6.5.2.2	Software Architecture and Performance	The ATMS software shall have a modern architecture and execute optimally on the ITM workstation and ATMS server to ensure: i. Instantaneous system responses for effective traffic management actions. ii. No loss of information (data, video, audio) from any source. iii. Seamless integration with CCTV, VIDES, VMS, and other ATMS equipment using standard interfaces (e.g., NTCIP) wherever available.

SI#	Requirement	Specification
		iv. Archiving of all information on the ATMS server for quick retrieval without impacting system performance.
6.5.2.3	Software Modularity	The ATMS software shall be modular and include at least the following modules: A. Data acquisition module B. Highway Traffic Monitoring module C. Incident/Accident Management Module D. Integrated audio communication module E. Report generation module and Dashboard F. System Administration module G. Communication module for external system access H. API Integrations with Vaahan, NPCI FASTag Mapper, Client ERP or NHAI's ERP (Datalake), 1033 CAD, Rajmarg, etc. I. Network management System G. Helpdesk and Inventory monitoring System
6.5.2.4	ATMS Web-based Application	The ATMS central application shall be web based on a modern architecture and shall optimally execute all the actions on the Control Centre workstation and servers.
6.5.3 Web-Application Landing Page		
6.5.3.1	Authentication	The landing page once the LDAP authentication happens shall be based on the user privileges/permissions & shall be a configurable one.
6.5.3.2	Customization	The landing page shall not have limitations in terms of customizing the required page. For clarity, the landing page for some users can be a map interface, for some users it can be a Dashboard and for some it can be device page – all driven by configuration.

SI#	Requirement	Specification
6.5.3.3	User and Groups	The ATMS Central Application users shall be grouped into several "User Groups" for ease in handling permissions.
6.5.3.4	Minimum Groups	There shall be a minimum of 5 (five) distinct User Groups as a standard feature and shall be possible to increase based on the Client requirement.
6.5.3.5	Group category	The User Groups shall be Administrator, Stakeholder, Manager, ATMS Operator, and Supervisor & Guest as a minimum.
6.5.3.6	Permission	Administrator shall have the right to give permission and define each of the users in the groups as per their functional applicability.
6.5.4 Map Module		
6.5.4.1	MAP Interface	The Map interface is one of the main interfaces for the ATMS Operators and other users in the ATMS Central Application.
6.5.4.2	Visual Map & database	The ATMS Central Application shall have a combination of Visual Map and a Map Database.
6.5.4.3	Switching	It shall be possible to switch across various visual map layers based on the use-cases and data availability.
6.5.4.4	Map database	The map database shall be a commercially available one which shall have turn table restrictions and routing, lane information which shall be used for ATMS use-cases.
6.5.4.5	Integration	It shall be possible for ATMS Central Application to integrate with any international standard commercial map database provider with minimal to no changes to the map database structure to be made compatible with ATMS.
6.5.4.6	Native Algorithm	The ATMS Central Application shall use its native algorithms for route selection use-cases using various data sources.

SI#	Requirement	Specification
6.5.4.7	Third Part Integration	The ATMS Central Application shall be capable of integrating with a separate Map Engine Server provided by a third party.
6.5.4.8	Fast rendering	The Map shall be rendered as a file for quick loading capability.
6.5.4.9	Filer layer and Zoom level	The map shall have different file layers for different zoom levels which shall be activated based on the selected zoom level by the user.
6.5.4.10	MAP LAYERS	A combination of the selected map layers and a map zoom level shall be possible for being saved as a "theme" which can be available for the ATMS operator readily next time.
6.5.4.11	Application User	It shall be possible to make a theme as a public or a private one which can be available for other ATMS Central Application users as well.
6.5.5 Data Acquisition module		
6.5.5.1	Data Acquisition Sources	Acquire data from various field equipment, including: - Data strings from VIDES, ATCC, WIM, VAS systems - Date/time, event details, alarms, and faults - Video streams from CCTV and VID cameras - Audio streams from emergency telephones (1033 and roadside)
6.5.5.2	Data Acquisition Conditions	Configure data acquisition based on: - User-specified time intervals (e.g., from ATCC) - Traffic-related events (e.g., VID data, emergency calls) - On-demand requests (e.g., CCTV video) - System events (equipment failures, user login/logout)
6.5.5.3	Data Storage	Store acquired data in the ATMS server using a database package like Oracle or MS SQL.
6.5.6 Traffic Management module & GIS Dashboard		

SI#	Requirement	Specification
6.5.6.1	Traffic Monitoring Display	Display the targeted road section or entire stretch on a large display (video wall) and ITM workstations. Use animated screens and GUIs (including, but not limited to, those specified in Clause 816.1 to 816.17 of MoRTH Specifications for Road and Bridge Works).
6.5.6.2	Interactive GIS Map	Provide an interactive GIS map (open source or proprietary) on all workstations and the video wall.
6.5.6.3	Device Icons	Display icons for CCTV, VIDES, VMS, and other devices on the GIS map.
6.5.6.4	Device Interaction	Clicking a device icon should: - Open the video feed for cameras. - Display the current message on VMS devices. - Allow authorized users to modify VMS messages.
6.5.6.5	VMS Message Update	Enable VMS message updates directly from the GIS map.
6.5.6.6	Incident Visualization	Modify device icons on the GIS map to highlight incidents triggered by VIDES or TMCS.
6.5.6.7	Event Creation and Dispatch	Enable "event creation" from VIDES/TMCS video streams, automatically capturing: - Photo from the stream - Location - Incident type (manual selection) - One-click dispatch of events to nearby emergency vehicles (if ICAD is set up).
6.5.6.8	Live Vehicle Tracking	Display live locations of emergency vehicles (crane, ambulance, RPVs) using AIS140 or ICAD data.
6.5.6.9	Traffic Flow Visualization	Highlight highway sections on the map to indicate traffic flow (different colors for different flow levels and directions) as identified by VIDES.
6.5.6.10	Device Status Indication	Change device icons on the map to indicate malfunctioning devices.
6.5.6.11	External Event Display	Display events received from external sources (1033, iCAD, Rajmarg Yatra) on the GIS map based on incident location.

SI#	Requirement	Specification
6.5.6.12	Manual Event Creation	Allow operators to manually create events for emergency response dispatch by clicking on any location on the map.
6.5.6.13	Strip Chart Interface	Provide a strip chart interface equivalent to the GIS map.
6.5.6.14	Zoom Functionality	Enable zooming into relevant map sections without loss of definition.
6.5.6.15	GUI Customization	Finalize project-specific GUI details during project execution in collaboration with Client.
6.5.7 Incident/Accident management module		
6.5.7.1	Incident Location and Marking	Allow operators to locate and mark incidents/accidents on a GIS map using a mouse.
6.5.7.2	Contextual Checklist	Display an online checklist for incident management procedures. Clicking checklist items activates related ATMS equipment.
6.5.7.3	Integrated Audio Communication	Provide seamless audio connection for the operator to ambulances, trauma centers, patrol vehicles, etc., regardless of the communication medium (mobile radio, phone, emergency telephone).
6.5.7.4	Automatic Camera Control	Automatically pan, tilt, and zoom nearby cameras to view the incident location.
6.5.7.5	VMS Message Integration	Interface with VMS control software to create and dispatch messages to VMS boards and mobile apps.
6.5.7.6	Checklist Source	Derive the checklist from the traffic management and rescue procedures in the highway's O&M manual or based on best practices.
6.5.7.7	Operator Action Logging	Log timestamps of operator actions on the checklist for performance analysis, training needs assessment, and SLA monitoring.
6.5.7.8	Automated Actions	Automatically perform predefined actions based on checklist items (e.g., camera control based on incident location).

SI#	Requirement	Specification
6.5.7.9	O&M Vehicle Tracking	Provide online tracking of O&M vehicles (ambulance, tow truck, patrol) with dynamic information display (shortest route, travel time).
6.5.7.10	Automated VMS Messages	Provide a user-programmable facility for automatic VMS message generation based on incidents and sensor data (e.g., visibility alerts). Require operator approval for message deployment.
6.5.7.11	Workflow Finalization	Finalize the detailed workflow and checklists with Client during project execution.
6.5.7.12	Comprehensive Functionality	Include all functionalities specified in 7.2.3 of the relevant document, including incident response and e-challan generation through NIC.
6.5.8 Integrated audio communication module		
6.5.8.1	Audio Communication Module Interface	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.
6.5.9 Report generation module & Dashboards		
6.5.9.1	Report Types	Generate periodic and on-demand reports, including: - Statistical reports for traffic planning, management, and forecasting (using VIDES, TMCS, ATCC data) - Reports to aid enforcement planning and strategizing - Reports related to acquired data, VMS messages, equipment availability, system malfunctions, user login/logout, daily accidents, VIDES events, e-challans, mobile app messages, and traffic flow data (volume, occupancy, classification, etc.) - Detailed performance reports covering incident detection, field operations team actions, and ATMS Control Center operator actions.

SI#	Requirement	Specification
6.5.9.2	Report Formats	- Tabular reports - Visually appealing dashboards and charts for efficient management, monitoring, and operations
6.5.9.3	Data Analysis	- Database/Data Analyst to conduct statistical analysis (on initiative and on request) and provide insights to the Client.
6.5.9.4	SLA Metrics Reporting	- Ensure all metrics mentioned in the SLA are easily available and automatically generated. - Provide an easy module to fetch footage for manual verification of random footage (if required for SLA calculation).
6.5.9.5	Data Transfer	- Automatic transfer of end-of-day reports to Client ERP or NHAI's Data Lake (or equivalent) via API.
6.5.9.6	Report Format Finalization	- Detailed report formats to be finalized by the Service Provider in consultation with Client. - Formats for select key standardized reports are provided in the Annexure.
6.5.9.7	Performance Reporting	- Provide automatic system-generated reports supporting the service provider's claim of meeting service level requirements.
6.5.10 Communication Module		
6.5.10.1	Access Control	Manage authorized access to the ATMS system for: - Authorized Client personnel/representatives - Other authorized Client systems (Regional Office Control Centre, Main Control Centre) - Any other system authorized by Client
6.5.10.2	Data Provision	Provide the following information to authorized entities upon request: - Live and archived video streams - Live and archived audio streams - Live and archived data strings and data elements
6.5.10.3	Data Exchange Protocols	Utilize standard data exchange protocols shared by NWPPL/NEPPL with the service provider.

SI#	Requirement	Specification
6.5.10.4	Integration with Vaahn Database, NPCI FASTag Mapper, Police Control Rooms, Dial 112, Data Lake, 1033 ICAD, Rajmarg etc.	ATMS software shall be required to be integrated with IT systems from Client or other Government Agencies from time to time basis This shall be possible no additional cost whether during installation or O&M phase of the contract.
6.5.11 Variable Message Sign		
6.5.11.1	Control System	A Control System with Variable Message Sign Control Software shall manage all VMS boards.
6.5.11.2	VMS Management	Software should manage all the VMS, supporting varying in sizes.
6.5.11.3	Open Architecture	Software shall operate on an open architecture and integrate with other subsystems (CCTV, VIDES, WIM, Speed Display, Roadside Communication, Traffic Management).
6.5.11.4	VMS Configuration	Software shall store configuration of each VMS (ID, location, brightness, pixel size, lines, language) and generate reports.
6.5.11.5	VIDES Integration	VMS boards shall integrate with VIDES for automatic incident warnings to traffic.
6.5.11.6	Adaptive Brightness	System shall support adaptive display brightness for readability.
6.5.11.7	CRC for Error Reporting	Software shall support CRC on display data and command packets for error reporting.
6.5.11.8	User Management	Administrator can create, edit, and delete users; manage access rights and VMS control permissions.
6.5.11.9	User Hierarchy	Administrator can place users in a hierarchy with at least 3 security levels; higher priority users inherit rights of lower priority users.
6.5.11.10	Audit Trail	System shall provide user activity logs with user ID, timestamp, and action performed.

SI#	Requirement	Specification
6.5.11.11	ATMS Control Centre	ATMS Control Centre will have a workstation for VMS operation and control of VMSs at various locations.
6.5.11.12	VMS Control Software	VMSs shall be accessed from ATMS Control Centre via workstations with VMS Control Workstation Frontend Software; software shall accept messages from Traffic Management console.
6.5.11.13	Regional Language Support	Software shall control VMSs configured for any regional language.
6.5.11.14	Request Control	Users can request control of VMS outside their access rights for a reservation period.
6.5.11.15	Simultaneous Operators	Multiple operators can simultaneously control VMSs from ATMS Control Centre.
6.5.11.16	Command Acknowledgement	All data and command packets shall have CRC; packets require acknowledgement from the display with its own CRC.
6.5.11.17	Response Packets	Response packets from VMSs shall include status and error codes.
6.5.11.18	Multicast/Broadcast	System shall support multicast and broadcast; these packets have no response packets from VMSs.
6.5.11.19	Message Display	Single or multiple messages can be displayed statically or in round robin mode.
6.5.11.20	Round Robin Duration	Message display duration in round robin mode is programmable (1 to 255 seconds).
6.5.11.21	Text Animations	VMS and software shall support text animations (scroll, flashing, typing, curtain effects, replace).
6.5.11.22	Dynamic Text Effects	Use of text effects shall be dynamically assignable and not a fixed global parameter.
6.5.11.23	Round Robin Message Limit	Ten strings can be sent in round robin mode.

SI#	Requirement	Specification
6.5.11.24	Database Tracking	Database Server shall track configurations, error data, configuration events, usage events, and error events.
6.5.12 ATCC Module		
6.5.12.1	Traffic Counting and Classification	The Control Center application shall maintain the Traffic Count and class of all passing vehicle.
6.5.12.2	Vehicle Recording and Classification	Each vehicle passing under the gantry shall be recorded and classified by the ANPR camera. The Number plate data shall be associated to each class along with speed.
6.5.12.3	Vehicle Classification Categories	Indicative vehicle classification for ATCC software: 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
6.5.12.4	Data Storage	Vehicle-wise traffic data (Vehicle Type, Number Plate, Date/Time) from each gantry shall be stored in a relational database at the command center for 180 days or until SLAs are assessed, whichever is longer. Photos are stored only for violations.
6.5.12.5	Data Sharing and Comparison	Data shall be shared with Client/NHAI/IHMCL for comparison with NPCI toll collection data to identify vehicles on the stretch that did not pay tolls.
6.5.12.6	Vehicle Class Verification	ATMS software shall identify vehicles whose class (identified visually) doesn't match the class from the NPCI FASTag mapper API and report these discrepancies to Client.
6.5.12.7	Reports	The Traffic Report of each section for the traffic count and class should be generated in the ATMS Application.

SI#	Requirement	Specification
6.5.13 VASD Module		
6.5.13.1	Speed Display Management	Software to acquire and manage data from all speed displays within the installation.
6.5.13.2	Scalability	Capable of managing any number of speed displays.
6.5.13.3	Open Architecture and Integration	Operate on an open architecture and integrate/co-exist with other subsystem software (CCTV, VMS, WIM, Roadside Communication, Traffic Management).
6.5.13.4	Configuration Storage and Reporting	Store and generate reports on the configuration of each speed display (preset speed limit, maximum speed limit, etc.).
6.5.13.5	User Management	Administrator can create, add, edit, delete users, and manage their access rights to system resources and specific speed displays.
6.5.13.6	User Hierarchy and Access Control	- Minimum 3 hierarchical levels of user access control. - Higher-priority users inherit rights of lower-priority users when taking over control of a speed display.
6.5.13.7	Audit Trail	Provide a user activity log with user ID, timestamp, and actions performed.
6.5.13.8	Real-time Data Processing	Receive and process real-time data packets from speed displays (if supported).
6.5.13.9	Operator Access	ATMS Control Center operators can access speed displays through workstations with dedicated frontend software.
6.5.13.10	Temporary Access Request	Users can request temporary access rights to speed displays outside their normal permissions.
6.5.13.11	Concurrent Access	Multiple operators can access speed displays simultaneously.

SI#	Requirement	Specification
6.5.13.12	Software Functionality	Options for checking configuration information, remote diagnostics, and data/violation record downloads.
6.5.13.13	Database Tracking	Database server tracks all configurations, error data, configuration events, usage events, and error events.
6.5.14 Video Recording Module/NVR		
6.5.14.1	Network Video Recorder	Network Video Recording or Video Recording Server for storing all the recording data captured from CCTV.
6.5.14.2	Multi-Camera Support	The Recording Server / System shall support Camera devices from various manufacturers.
6.5.14.3	IP based Camera Recording	NVRs shall have in-built capabilities of recording video and audio streams directly from IP based cameras installed at Field.
6.5.14.4	ONVIF	NVRs shall be ONVIF compliant.
6.5.14.5	Central Software	NVRs shall be capable of reviewing video and audio streams on-demand using the supplied central software.
6.5.14.6	Alarm Generation	NVRs shall be capable of storing all alarms generated as part of the CCTV surveillance system.
6.5.14.7	Remote View	NVRs shall be network enabled for remote access, viewing, management and status monitoring. Username and Password protection is required for access. The system must provide for remote administrator management of usernames, Passwords and management of definable end user rights.
6.5.14.8	Configurable Recording	NVR Unit(s) shall provide Fully configurable recording options to include, but not limited to: Full record

SI#	Requirement	Specification
		Variable Frame rate Variable resolution Variable bitrate, if available Change of recording configurations on receipt of an alarm globally and/or per camera Enable audio recording on receipt of an alarm
6.5.15 Integrated Audio Communication unit		
6.5.15.1	Integrated Communication	The system shall enable the Traffic Manager to communicate seamlessly with all stakeholders (e.g., emergency services, field personnel, other agencies) regardless of the communication medium (e.g., radio, mobile phone, landline, emergency roadside phone).
6.5.15.2	Hardware Interface	The system shall utilize a digital telephone exchange with software control to facilitate communication.
6.5.15.3	User Interface	The Traffic Manager shall initiate communication through a headset or handset, by selecting options from a context-sensitive checklist or icons on the ITM workstation screen.
6.5.15.4	Communication Modes	The system shall support communication between the Traffic Manager and a single stakeholder or a group of stakeholders.
6.5.15.5	Backup Communication	The system shall provide a backup option for communication using physical push-buttons on the unit.
6.5.15.6	Call Logging and Recording	The system shall automatically log all calls and record them. Recordings shall be kept for a minimum of 180 days or until SLAs have been assessed for that period, whichever is longer.
6.5.15.7	SLA Monitoring	Call logs and recordings shall be used for monitoring Service Level Agreements (SLAs).

SI#	Requirement	Specification
6.5.15.8	Integrated Communication	The system shall enable the Traffic Manager to communicate seamlessly with all stakeholders (e.g., emergency services, field personnel, other agencies) regardless of the communication medium (e.g., radio, mobile phone, landline, emergency roadside phone).
6.5.15.9	Hardware Interface	The system shall utilize a digital telephone exchange with software control to facilitate communication.
6.5.16 Interface with Mobile Phone App		
6.5.16.1	Interface with Rajmarg Yatra App	The ATMS control center system shall seamlessly interface with NHAI's Rajmarg Yatra app for road users.
6.5.16.2	Receive Incident Information	Get live information from incidents reported by highway users. Generate an incident event and alert the operator. API shall provide location, photo, and incident type. Automatically identify the nearest TMCS camera.
6.5.16.3	Send Traffic Information	Send information regarding traffic, congestion, maintenance work, incidents, accidents, and manual messages to Rajmarg Yatra users. Geo-tag and broadcast messages to users in the vicinity of incidents. Inform Rajmarg when events like construction are closed.
6.5.16.4	Interface with App for Enforcement Agencies	Integrate with a centralized integrated computer-aided dispatch (ICAD) system if utilized by Client or NHAI.
6.5.16.5	Receive Incident Information from ICAD	Incidents identified by 1033 shall be communicated to the ATMS Command Centre by creating logins for Operators on the ICAD or through API integration.
6.5.16.6	Send Incident Information to ICAD	Incidents identified by the command center requiring emergency vehicles should be communicated to response teams through the

SI#	Requirement	Specification
		centralized ICAD. Allow sending tickets/events to dispatch vehicles, track them, and close events.
6.5.16.7	Interface with Rajmarg Yatra App	The ATMS control center system shall seamlessly interface with NHA's Rajmarg Yatra app for road users.
6.5.16.8	Receive Incident Information	Get live information from incidents reported by highway users. Generate an incident event and alert the operator. API shall provide location, photo, and incident type. Automatically identify the nearest TMCS camera.
6.5.16.9	Send Traffic Information	Send information regarding traffic, congestion, maintenance work, incidents, accidents, and manual messages to Rajmarg Yatra users. Geo-tag and broadcast messages to users in the vicinity of incidents. Inform Rajmarg when events like construction are closed.

6.6 Optical Fiber Cable (OFC) based Digital Communication System

The System Integrator shall be responsible for setup of the Digital Communication System throughout the road stretch, underpass, service roads, entry/exit ramps and all other facilities of Road stretch wherever ATMS surveillance, incident detection or any other ATMS functionality is required to be deployed. The Communication system shall be setup considering the following key points:

6.6.1 Network Design and Planning

- 6.6.1.1 Conduct a detailed survey of the highway route, including topography, existing infrastructure, and potential interference zones.
- 6.6.1.2 Design a robust and scalable OFC network topology, considering future expansion and service requirements.
- 6.6.1.3 Develop detailed engineering drawings and specifications for the OFC network, including cable routes, duct layouts, and equipment installations.

- 6.6.1.4 The fiber optic cable should be of the single mode cables and associated network equipment should be accordingly. The fiber optic cable is to be installed in earth trenches and suitably sized high-density polyethylene (HDPE) duct should be used to install the OFC.
- 6.6.1.5 The cable used for short-haul connectivity between outdoor equipment & Access points, access point to backbone etc. should have fiber count as per the design requirements (4/6/12 cores). These should be based on the location of equipment along the highway.
- 6.6.1.6 OFC & HDPE Conduit should be installed as per the route available at the project site.

6.6.2 **Trenching, Ducting and Ancillary Civil Works for Communication System**

- 6.6.2.1 Conduct necessary civil works, such as trenching, duct laying, manhole construction, and cable termination points, adhering to specifications and industry standards.
- 6.6.2.2 Providing the chamber cover, soil/sand filling in chambers, placing route markers (**On every 100 Meters**) for OFC installation and other associated work required for OFC.
- 6.6.2.3 Laying of Safety/warning tape (above one feet of OFC duct) before back filling the trench .
- 6.6.2.4 Ensure proper coordination with other utilities and agencies to minimize disruptions and obtain necessary permits.
The Optical Fiber Cable should be laid through PLB HDPE Ducts buried at a nominal depth of 700 mm. All Depths should be measured from the top of duct.
- 6.6.2.5 Laid PLB HDPE Ducts/coils should be coupled by sockets/push fit coupler in excavated trenches, and sealing of PLB HDPE Ducts pipe ends at every manhole by end-plugs of appropriate size.
- 6.6.2.6 Additional protection should be provided by R.C.C. Pipes/GI pipes / concreting/, wherever required. HDPE PLB duct should be fixed with clamps on culverts/bridges wherever necessary. In case trenching and duct laying is not
 - 6.6.2.6.1 Possible on the culverts; the duct should be laid on the surface of the culverts/ bridges and should be protected through concreting. The Joint chamber should be provided at every joint location to keep the OFC joint well

protected and also to house extra length of cable which may be required in the event of faults at a later date. The Joint chamber should be of pre-cast RCC type as per construction specification. RCC cover or stone of suitable size on jointing chamber should be provided.

6.6.2.7 The Route/Joint indicators should be co-located with each manhole/joint chamber. In addition Route indicators are also should be placed where route changes direction like road crossings etc. Either RCC/Pre-cast or Stone based route indicators should be used.

6.6.2.8 The minimum duct size for optical fiber cables (OFC) is **40 mm OD/33 mm ID**. These high-density polyethylene (HDPE) pipes are designed to house optical fibers and are suitable for pulling OFC.

6.6.3 **OFC Cable Installation**

6.6.3.1 The Bidder must supply and install the minimum 24 Core armoured Optical Fiber Cable throughout the stretch to connect all ATMS site components with the control room.

6.6.3.2 Supply and Installation of high-quality optical fiber cables, including feeder and distribution cables, following industry best practices.

6.6.3.3 Excavation should be carried out by use of Labour/ electro mechanical means. Trenching should as far as possible be kept ahead of the laying of pipes. Due care should be taken that the soil from trenching intended to be loose for back filling is not mixed with loose debris.

6.6.3.4 Splice and terminate OFC using precision tools and techniques to ensure optimal performance.

6.6.3.5 Test and certify the installed OFC to meet specified performance standards.

6.6.3.6 Procure and install network equipment, including OFC termination panels, patch panels, multiplexers, switches, routers, and power supplies.

6.6.3.7 Configure and integrate network equipment to meet the specific requirements of the project.

6.6.3.8 Conduct rigorous testing and commissioning of the installed equipment to ensure proper functionality.

6.6.3.9 The following types of cables should be used for Project. These cables are required for powering and controlling of equipment. These cables are besides from OFC Cable.

6.6.3.10 Cables are mainly categorized into two types:

indoor type: The indoor cable should comply with the following technical specifications:

- Bright annealed, 99.97% electrolytic grade
- Copper conductor (stranded)
- Voltage grade 1100 V
- Single or multi core cable
- Flame retardant low smoke (FRLS)
- PVC insulated, rodent repellent
- With high oxygen and temperature index
- Un-armoured S 694, IS 8130 or BS 6004/ BS 6500 IEC 6050

7. Outdoor type: The outdoor cable should comply with the following technical specifications:

- Bright annealed, 99.97% electrolytic grade
- Copper conductor (solid/stranded)
- Voltage grade 1100 V
- Single or multi core cable
- Flame retardant low smoke (FRLS)
- PVC / XLPE insulated
- With high oxygen and temperature index
- Armoured

6.6.3.11 The cable types are divided according to application used for communication.

Indoor power cable	3 core, minimum 1.5 sqmm flexible
Outdoor power cable	3 core, minimum 1.5 sqmm to 22 sqmm
Earthing cable	16 sq mm copper PVC insulated cable
Network Ethernet Cable	UTP CAT 6 for indoor use STP CAT-6 for outdoor use
OFC	24 Core Armoured Cable

6.6.4 **OFC Integration and Testing**

6.6.4.1 Integrate the OFC network with all ATMS Systems, Internet Routing and external systems/agencies as per the requirement of client.

6.6.4.2 Conduct comprehensive system testing, including OFC, network connectivity testing, and performance testing.

6.6.5 **Communication System Maintenance**

6.6.5.1 Provide comprehensive operation and maintenance (O&M) services for the OFC network, including routine inspections, fault diagnosis, and repair.

6.6.5.2 Establish a robust network monitoring system to proactively identify and address potential issues.

6.6.5.3 Provide 24/7 technical support to ensure uninterrupted network operation.

6.6.6 **Network Security Implementation**

6.6.6.1 Implement appropriate security measures to protect the OFC network from unauthorized access and damage.

6.6.6.2 Implement access control measures to restrict access to critical network components.

6.6.6.3 Develop and implement a security incident response plan.

6.7 Emergency Roadside Telephone System (ERTS) or Emergency Call Box (ECB)

6.7.1 Functional Requirement of EBC

Sl#	Requirement	Description
6.7.1.1	System Definition	The Emergency Roadside Telephone (ERT) or "Phone" includes the phone instrument, mounting hardware, pole or structure, grouting, charging stations, batteries, and solar modules if used.
6.7.1.2	Installation Locations	ERTs are recommended for installation every 2 kilometers on all access-controlled highways and hilly roads. For other highways, the National Highways Authority of India (NHAI) will assess the need.
6.7.1.3	Primary Function	ERTs allow road users to make emergency calls to the local ATMS Control Centre to report accidents or other situations requiring immediate assistance.
6.7.1.4	Network Compatibility	The system must be capable of operating on a Fibre Optic, dedicated copper, or wireless transmission network. It must also support duplex mode communication.
6.7.1.5	User Interface	The phone must have a built-in speaker and microphone for hands-free operation. It requires a clearly labeled "activate" button to start a call.
6.7.1.6	Call Status Indicators	The system must provide both audio and visual indicators for the call status, such as call placed, acknowledged, in progress, or on hold.
6.7.1.7	Call Operation	A user initiates a call by pushing the call button. A ring tone will sound if the call is successfully initiated.

Sl#	Requirement	Description
6.7.1.8	Busy Line Handling	At least three numbers will be programmed into the device to minimize busy lines. The unit will automatically dial each number in sequence until a connection is made or the call is canceled. If all lines are busy, a busy tone with a voice message in English, Hindi, and the local language will play , and there will be an option to record a message.
6.7.1.9	System Failure Notification	If the system is not functioning, a distinctive tone and a suitable message will be played.
6.7.1.10	Power Supply	The system must have a provision to operate during a primary power failure. It must use a battery-backed power source, which should preferably be solar-charged. The system must have an automated start-up capability after a power outage and restoration.
6.7.1.11	Self-Diagnostics	Phone units must have self-diagnostics to test for correct operation. Any detected malfunction and its nature must be immediately reported to the control room system.
6.7.1.12	Scheduled Maintenance	Scheduled tests of the speaker and microphone for all phone units must be performed at regular intervals.
6.7.1.13	Data Logging	All alarms, self-diagnostic test results, and other data related to the ERT system must be logged to a central database.
6.7.1.14	Tamper Detection	Any attempted damage detected by the anti-tampering sensor must be recorded separately for quick access.
6.7.1.15	Physical Build	The front facia of the ERT phones must be suitable for rugged outdoor use.

6.8 Mobile Radio Communication System (MRCS)

6.8.1 Functional Requirement

Sr. No.	Functional Requirement	Details
6.8.1.1	MRCS System	The System Integrator shall provide the MRCS to cover the entire project stretch. Facilitating communication between the ATMS Control Centre and Vehicle Mounted Units and among each other.
6.8.1.2	Solution Design	The System integrator shall design the MRCS coverage ensuring no area of stretch left without coverage. During the entire stretch, all vehicle units and handset should work with adequate quality. MRCS shall Support communication for emergency responses for routine operations and maintenance activities on highways.
6.8.1.3	MRCS Scope	The System integrator shall be responsible for entire civil work, electrical work, communication work, tower erection, antenna installation, alignment, software setup along with comprehensive AMC for a duration of 05 years.
6.8.1.4	Control Room	Including base/repeater stations. Including necessary control equipment. Having a provision for a voice logger to be attached to it. Ensuring the voice logger is capable of recording all communications facilitated by the MRCS.
6.8.1.5	MRCS Device	Being fitted on Ambulances, Cranes, and Patrolling Vehicles (RPVs). Facilitating instant communication even when the vehicles are in motion across the highway.

6.8.1.6	Call Types Supported	The radio shall support broadcast calls, group calls, and individual calls.
6.8.1.7	Communication Links	It shall be possible to establish ATMS to field unit links, field unit to ATMS links, or field unit to field unit links.
6.8.1.8	Integration	The mobile radio system shall be integrated via the Fiber optic communication system (e.g., Inter-tower communication).
6.8.1.9	Call Management Features	The system shall have facilities for waiting calls, holding calls, and transferring calls.
6.8.1.10	Call Queuing	Call queuing shall be supported if all communication paths/channels are busy.
6.8.1.11	Priority Levels	The system shall support multiple priority levels with pre-emption.
6.8.1.12	Field Unit to Field Unit Call Termination	Field unit to field unit calls shall auto-terminate if either party hangs up, the ATMS control center initiates a call to one of the parties, or the conversation exceeds 5 minutes.
6.8.1.13	Late Entry	The system shall have a late entry feature.
6.8.1.14	PSTN Bridging	It shall be possible to bridge the regular PSTN network to the mobile radio network in case of emergencies.
6.8.1.15	Simultaneous Calls (Base Unit)	The base unit installed at the ATMS control center shall be capable of processing at least 3 calls simultaneously.
6.8.1.16	Emergency Messaging	In case of emergency, it shall be possible to exchange quick, short, status/alarm messages.

6.8.1.17	Voting System	The system shall have a suitable voting system to select the better signal at base stations as well as mobile units.
6.8.1.18	System Redundancy	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.
6.8.1.19	Frequency Usage	The system shall use frequencies obtained by the ATMS Service Provider from WPC in the complete stretch as per scope.
6.8.1.20	Power Protection	The system shall be protected against any damage due to power supply fluctuations, transients, and surges.

7 TECHNICAL SPECIFICATION OF ATMS

- (A) **General Requirements for Camera Systems:** All proposed Camera systems must fully comply with the "Essential Requirement (ER) for Security of CCTV" BIS certification, as mandated by Gazette notification CG-DL-E-09042024-253632 dated 09 April 2024, including any subsequent amendments. As part of their bid submission, the Bidder shall provide a written undertaking confirming the supplied camera system shall comply with the above-mentioned certification before Commissioning and Go-Live of System. In case, the supplied camera doesn't comply with the "Essential Requirement (ER) for Security of CCTV" BIS certification before Commissioning of System, the Bidder must replace all the Cameras duly complied with "Essential Requirement (ER) for Security of CCTV" BIS certification with prior approval and without any cost implication to Client.
- Technical Specifications of TMCS

SL#	Parameter	Specification
7.1.1 TMCS Cameras Technical Specifications		
7.1.1.1	Rated Resolution	- Vehicle characteristics (Size, Shape and Color) and class discernible from 500 meters at full optical zoom.
7.1.1.2	Minimum Sensitivity	- 0.02 lux for color images at 1/15 shutter speed.
7.1.1.3	Light Range Adaptation	- AGC and Auto Iris combination to provide 10000:1 or better.
7.1.1.4	Environmental Rating	- Rated for outdoor use.
7.1.1.5	Day/Night Functionality	- Day-night IR filter for color daytime images and night vision in low light.
7.1.1.6	IR Illuminator	- Inbuilt IR illuminator with 500 -meter range.
7.1.1.7	Communication	- Support wired ethernet, WIFI, OFC, 4G/5G for system scalability and integration.
7.1.1.8	PTZ Functionality	- 360-degree pan, 2 to 92-degree tilt. - Minimum 35x optical zoom, 16x digital zoom.

SL#	Parameter	Specification
		- Closed-loop speed control with integral pan/tilt motor drive for smooth and precise movement.
7.1.1.9	Window	- Flat glass window with internal heater for optimal performance in humid and rainy conditions.
7.1.1.10	Housing	- Waterproof, weather-sealed, and corrosion-resistant.
7.1.1.11	Image Stability	- Ensure stable image up to 200 km/h wind speed and during heavy vehicle vibrations. - Vehicle make and model identifiable at full zoom in these conditions.
7.1.1.12	Image Sensor	- 1/3" or better
7.1.1.13	Resolution	- Minimum 4 MP
7.1.1.14	Sensitivity	- 0.005 lux (B/W), less than 0.06 lux (Color) or better
7.1.1.15	Focus	- 3.5mm to 129mm or better
7.1.1.16	Optical Zoom	- 35x or better
7.1.1.17	Digital Zoom	- 16x
7.1.1.18	Night Vision	- Up to 500m
7.1.1.19	Signal to Noise Ratio	- > 54 dB
7.1.1.20	AGC	- Automatic
7.1.1.21	White Balance	- Automatic
7.1.1.22	Electronic Shutter	- Auto/Manual, 1/1 ~ 1/30,000s
7.1.1.23	Iris Control	- Automatic
7.1.1.24	Encoding	- H.265 or JPEG
7.1.1.25	Video Output	- Ethernet 10/100Base-T
7.1.1.26	Pan Range	- 0 to 360 degrees, auto flip at 180 degrees
7.1.1.27	Pan Speed	- Variable 0.2 degrees/sec to 80 degrees/sec
7.1.1.28	Tilt Range	- -10 to +90 degrees
7.1.1.29	Tilt Speed	- Variable 0.2 degrees/sec to 40 degrees/sec
7.1.1.30	Preset Positions	- 255 minimum

SL#	Parameter	Specification
7.1.1.31	Housing	- IP66 or better
7.1.1.32	Power	- 230V, 50 Hz domestic supply
7.1.1.33	Protection	- Class D for data/signal lines, Class B for power
7.1.2 TMCS Road Side Unit Specification		
7.1.2.1	Road Side Unit	1. TMCS Roadside Units (RSUs) shall be equipped with a 6-hour power backup when supplied by combined raw and renewable energy, or a 24-hour power backup in locations where only solar power is available. 2. The enclosure shall be weatherproof and meet the operating temperature requirements of all installed components. 3. The contractor shall provide all clamps, accessories, including the Line Interface Unit (LIU), data and power cabling, and the Power Junction Box/MCB. 4. The network switch shall be industrial-grade and have a minimum of 4 ports, including 2 SFP ports. 5. Solar panels, along with hybrid UPS (solar and raw power), and lithium-ion batteries shall be supplied to meet the minimum backup duration. 6. The solar panel backup capacity shall be calculated to account for all climatic conditions. 7. The contractor shall provide all other necessary electronics, earthing, and surge protection.
7.1.3 TMCS environmental Specification		

SL#	Parameter	Specification
7.1.3.1	Operating Temperature and Humidity	- Cameras and connected outdoor (RSU) equipment shall operate from -10°C to 55°C of ambient temperature. - Relative humidity up to 95% non-condensing. - Necessary equipment for achieving this range shall be included.
7.1.3.2	Camera Housing	IP66 rating or better.

7.2 Technical Specifications of VIDES

SL#	Parameter	Specification
7.2.1 Video Camera (Overview)		
7.2.1.1	Camera Type	High-resolution, 1/3" image format CMOS camera designed for professional video surveillance.
7.2.1.2	Image Quality	Provide detailed video without lag, image retention, or geometric distortion.
7.2.1.3	Low-light Performance	Great low light sensitivity, electronic shutter, automatic gain control, and backlight compensation for operation in wide lighting conditions.
7.2.1.4	Night Vision	Minimum 100 Meter Night Vision IR Infrared illuminators or thermal sensors to ensure incident detection (debris, fog, accidents, pedestrian, animal crossing etc.).
7.2.1.5	Rated Input Voltage	230 VAC, 50 Hz
7.2.1.6	Imager	1/3" format CMOS
7.2.1.7	Sync. System	Internal with Crystal, External with Mains Synchronization or better
7.2.1.8	Active Picture Elements	4 MP or higher to meet functional requirements
7.2.1.9	Signal to Noise Ratio	> 50 dB minimum

SL#	Parameter	Specification
7.2.1.10	Minimum Illumination	0.15 Lux (F1.2, AGC On) at 50m IRE
7.2.1.11	Electronic Shutter	Manual: 1/50 to 1/10000 sec, 8 selections possible. Automatic: AES 1/50 to 1/100000 sec.
7.2.1.12	Back Light Compensation	6 zones or better technologies
7.2.1.13	Camera Text in Picture	16 character title anywhere on screen
7.2.1.14	Encoding for ATMS Integration	H.265 (MPEG-4 Part 10 (AVC))/JPEG
7.2.1.15	Night Vision Capabilities	IR or Thermal or any other method meeting functional requirements economically.
7.2.1.16	Note: The SI may also offer a CCTV Camera system with a built-in Video analytics feature meeting the functional requirements.	
7.2.2 ANPR Camera		
7.2.2.1	Camera Placement	One ANPR camera per lane facing traffic flow, including hard shoulder.
7.2.2.2	Number Plate Capture	Capture the number plate of every vehicle passing under the gantry, regardless of incident detection.
7.2.2.3	Incident Linking	Correctly link vehicle number plates with incidents detected by the overview camera. Operate in tandem with overview camera as needed.
7.2.2.4	License Plate Types	Capture both retro-reflective and non-retro-reflective license plates.
7.2.2.5	Incident Detection	Identify incidents suitable for its viewing angle (seat belt, triple riding, no-helmet, etc.).
7.2.2.6	ANPR Success Rate	> 90% success rate day/night, capturing plates from vehicles (including two-wheelers) at speeds up to 180 kmph for standard/near-standard plates. Solution provider to improve the model over time to adapt to changing plate designs.

SL#	Parameter	Specification
7.2.2.7	Weather Resistance	Support to function in adverse weather conditions.
7.2.2.8	Manual Recognition	Capture images for manual recognition if ANPR fails. No manual annotation of predictions or low-confidence recognitions. Command center software allows operators to zoom and correct recognized number plates from the snapshots.
7.2.2.9	Challan Verification	Manual vetting of challan-related number plate recognitions before handover to enforcement agencies.
7.2.2.10	Calibration and Testing	Monthly calibration and testing in presence of Client or authorized representative.
7.2.2.11	Number Plate Alarms	Command centre software should support number plate alarms (stolen vehicles, hotlist, etc.) and notify operators for communication to police/enforcement agencies.
7.2.2.12	Rated Input Voltage	230 VAC, 50 Hz
7.2.2.13	Imager	1/3" format CMOS with Full HD and Global Shutter
7.2.2.14	Sync. System	Internal with Crystal, External with Mains Synchronization
7.2.2.15	Active Picture Elements	4 MP per lane of coverage or higher to meet the functional requirement
7.2.2.16	Signal to Noise Ratio	> 50 dB minimum
7.2.2.17	Minimum Illumination	0.15 Lux (F1.2, AGC On) at 50m IR
7.2.2.18	Electronic Shutter	Manual: 1/50 to 1/10000 sec, 8 selections possible. Automatic: AES 1/50 to 1/100000 sec.
7.2.2.19	Back Light Compensation	6 zones or better technology
7.2.2.20	Camera Text in Picture	16 character title anywhere on screen
7.2.2.21	Encoding for ATMS Integration	H.265/JPEG (MPEG-4 Part 10 (AVC))

SL#	Parameter	Specification
7.2.2.22	Night Vision Capabilities	IR Illuminator- 50 Meter or higher
7.2.3 Camera Housing (for ANPR and Overview cameras)		
7.2.3.1	IP Rating	IP66
7.2.3.2	Camera Mounting	Vandal-proof wall/pole/corner/hanging mount as per site requirement
7.2.3.3	Cable Entry	IP66 compliant cable pass-through
7.2.3.4	Finish	Off-white semi-gloss
7.2.3.5	Construction	Aluminium or engineering plastic with optically clear UV protected polycarbonate dome
7.2.3.6	Fan-Assisted	24/7 fan-assisted thermostatically controlled heater/defogger/forced air cooler
7.2.4 Amber Flashing Light		
7.2.4.1	Pole mounted flashing lights	Minimum 300mm diameter, visibility of at least 500m
7.2.4.2	Power supply	Local solar PV based with inbuilt Li-ion battery
7.2.4.3	Interconnection	Incident detection system by cable or wireless (GSM based)
7.2.4.4	Flashing mode activation	During incident detected by VIDES or TMC/Sub-centre operator
7.2.4.5	Remote control	TMC/Sub-centre operator can turn on/off lights remotely
7.2.4.6	Flashing mode deactivation	Disappearance of detected incidents or reset by TMC/Sub-centre operator
7.2.4.7	Failure mode	Lights switch to flashing mode by default if VIDES LPU fails
7.2.5 VIDES Road Side Unit Specification		
7.2.5.1	Road Side Unit	1. VIDES Roadside Units (RSUs) shall be equipped with a 6-hour power backup when supplied by combined raw and renewable energy, or a 24-hour

SL#	Parameter	Specification
		power backup in locations where only solar power is available. - VIDES LPU shall be rugged industrial grade fanless computer with minimum i7 (10th Gen or higher) processor, 16 GB RAM , GPU as per bidder solution, 1 TB SSD storage or more as to meet the functional requirements. - The enclosure shall be weatherproof and meet the operating temperature requirements of all installed components. - The contractor shall provide all clamps, accessories, including the Line Interface Unit (LIU), data and power cabling, and the Power Junction Box/MCB. - The network switch shall be industrial-grade and have a minimum of 4 ports, including 2 SFP ports. - Solar panels, along with hybrid UPS (solar and raw power), and lithium-ion batteries shall be supplied to meet the minimum backup duration. - The solar panel backup capacity shall be calculated to account for all climatic conditions. - The contractor shall provide all other necessary electronics, earthing, and surge protection.
7.2.6 Environmental Requirements		
7.2.6.1	Operating Temperature and Humidity	- Cameras and connected outdoor equipment shall operate from -10°C to 55°C. - Relative humidity (RH) up to 95% non-condensing. - Necessary equipment for achieving this range shall be included.
7.2.6.2	Equipment Housing	IP66 rating or better.

7.3 Technical Specification of VASD

SL#	Technical Specification	Description
7.3.1 Speed Display Specification		
7.3.1.1	Display Construction	Modular design with individual modules
7.3.1.2	Display Panel	Corrosion-resistant panel with LED pixels in a row:column matrix
7.3.1.3	Multiplexing Ratio	1/8 or better
7.3.1.4	LEDs	Outdoor-rated individual LEDs
7.3.1.5	Communication Interface	Support for TCP/IP (copper, fiber optic), Wi-Fi
7.3.1.6	Data Logging	Time-stamped record of speed and vehicle image for each overspeeding instance, retrievable via network or local laptop connection
7.3.1.7	Real-Time Violation Event Reporting	Configurable to send real-time violation records (speed, image, timestamp) over the network
7.3.1.8	Brightness Control	Automatic brightness control using built-in light sensors
7.3.1.9	PCB Material and Thickness	FR4 material, 1.6mm thick (2.4mm for LED matrix PCB), PCB shall be quality suitable to use in the environment condition prescribed.
7.3.1.10	Local Diagnostics	Diagnostic access via laptop connected to communication port
7.3.1.11	Fault Diagnostics	Minimum includes display failure and radar failure detection
7.3.1.12	Display size	Minimum Width 900 MM Minimum Height 900 MM
7.3.1.13	Viewing Angle	15 to 30 degrees
7.3.1.14	Color and Wavelength (nm)	Red (625), Amber (590), Green (525)

SL#	Technical Specification	Description
7.3.1.15	Luminous Intensity	7500 candela per meter square.
7.3.1.16	Power Feed	230V AC @ 50Hz, with Battery backup and preferably solar chargeable
7.3.1.17	Mounting	Fixed over gantry
7.3.1.18	Humidity	0 to 95% non-condensing
7.3.1.19	Operating Temperature (Ambient)	-10°C to 55°C
7.3.1.20	Construction	Weatherproof outdoor non sealed ventilated
7.3.1.21	Communication	Ethernet on Copper, Fiber, Radio (4G/5G, Bluetooth and Wi-Fi)
7.3.1.22	Protocol	TCP/IP, NTCIP, SNMP
7.3.1.23	Operation	Software for VAS display sign configuration and log file retrieval.
7.3.2 Speed Radar		
7.3.2.1	Monitoring Lanes	Three/four lanes plus hard & earthen shoulder
7.3.2.2	VASD Display	Real-time speed of vehicle in each lane
7.3.2.3	Hard/Earthen Shoulder	Speed displayed on adjacent display
7.3.2.4	Tracking Scenarios	Multiple car tailgating, Parallel motion, High occlusion target scenarios
7.3.2.5	Accuracy	High accuracy and detection range
7.3.2.6	Operational Range	90 meters
7.3.2.7	Tracking Capacity	Up to 32 vehicles simultaneously
7.3.2.8	Speed Detection Accuracy	More than 98% at speed range of 0.5 to 200 km/hr
7.3.2.9	Inbuilt or external Radar in VASD	Acceptable if accuracy level of more than 98% at speed range of 0.5 to 200 km/hr, read range of 100 meters

SL#	Technical Specification	Description
7.3.2.10	Calibration and Testing	Calibrated and tested by third-party, certificates submitted with Technical Proposal and commissioning
7.3.3 VASD Road Side Unit		
7.3.3.1	Road Side Unit	1. VASD Roadside Units (RSUs) shall be equipped with a 6-hour power backup including Raw power and solar based power supply source. 2. The VASD LPU shall be one LPU for both the directors to control the VIDES displays as per the bidder solution requirement. 3. The enclosure shall be weatherproof and meet the operating temperature requirements of all installed components. 4. The contractor shall provide all clamps, accessories, including the Line Interface Unit (LIU), data and power cabling, and the Power Junction Box/MCB. 5. The network switch shall be industrial-grade and have a minimum of 4 ports, including 2 SFP ports. 6. Solar panels, along with hybrid UPS (solar and raw power), and lithium-ion batteries shall be supplied to meet the minimum backup duration.

SL#	Technical Specification	Description
		7. The solar panel backup capacity shall be calculated to account for all climatic conditions. 8. The contractor shall provide all other necessary electronics, earthing, and surge protection.
7.3.4 Environmental Specifications		
7.3.4.1	Change of Temperature Test	IS 9000 Part XIV Sect. II
7.3.4.2	Dry Heat Test	IEC-571; IS: 9000 Part-III Sect 3
7.3.4.3	Cold Test	IS 9000 Part II Sect. III
7.3.4.4	Damp Heat Test (Cyclic)	IS 9000 Part V Sect. 2 Variant 1
7.3.4.5	Damp Heat Test (Steady State Storage)	IS 9000 Part IV
7.3.4.6	Salt Mist Test	IS 9000 Part XI Procedure 3
7.3.4.7	Dust Test	IS 9000 Part XII
7.3.4.8	Bump Test	IS 9000 Part VII, Sec. 2
7.3.4.9	Vibration Test	TEC (IPT 1001A revised)

7.4 Technical Specifications of VMS

SL#	Technical Specification	Description
7.4.1 VMS Specifications		
7.4.1.1	Display Construction	Modular design with individual modules
7.4.1.2	Display Panel	Corrosion-resistant panel with LED pixels in a row:column matrix (Full Matrix display)
7.4.1.3	Multiplexing Ratio	1/8 or better
7.4.1.4	LEDs	Outdoor-rated individual LEDs

SL#	Technical Specification	Description
7.4.1.5	Display Row Independence	Failure of one text row shall not affect other rows. It shall be capable to query the Row status.
7.4.1.6	Character Encoding	Unicode for displaying messages in English, Hindi, and a selected local language
7.4.1.7	Pixel Pitch	P10
7.4.1.8	Viewing Distance	Fixed VMS: 250 Meters or better Portable VMS: 150 Meters or better
7.4.1.9	Data Integrity	Built-in test and monitoring facilities to ensure data integrity of messages
7.4.1.10	Automatic Intensity Adjustment	Automatic display intensity adjustment based on ambient light conditions
7.4.1.11	Display Properties	Non-reflective background, UV resistant
7.4.1.12	Communication Interfaces	Support for multiple industry-standard communication interfaces, including (minimum): - RS-422 - TCP/IP - Wi-Fi - Optical fiber cable.
7.4.1.13	Communication Protocols	Support for NTCIP and at least one defined communication protocol (NMCS2, MESSAGECONTROL, TR2070D V2, or equivalent)
7.4.1.14	Brightness Control	Automatic brightness control via built-in light sensors or remote control through VMS control software
7.4.1.15	PCB Material and Thickness	FR4 material, 1.6mm thick or better (2.4mm for LED matrix PCB)
7.4.1.16	Local Diagnostics	Diagnostic access via laptop connected to any communication port

SL#	Technical Specification	Description
7.4.1.17	Physical Dimensions (Excluding frame)	Portable VMS (Trolley Mounted): Length (min) 1650 ± 100mm, Height (min) 1000 ± 100mm L-Type Fixed VMS: Length (min) 2400 ± 100mm, Height (min) 1500 ± 100mm M-Type Full Fixed VMS: Length (min) 5000 ± 200mm, Height (min) 1800 ± 200mm - Depth : up to 200mm (for all types) to better
7.4.1.18	Fault Diagnostics	Minimum includes: - Power failure detection - Processor PCB failure detection - Display line failure detection - Incoming data/communication error detection - Enclosure temperature information
7.4.1.19	VMS Housing	IP 65 or better for all types of VMS
7.4.1.20	Standards Compliance	Compliance with the latest editions of IRC 67 and IRC SP 85
7.4.2 VMS Road Side unit		
7.4.2.1	Road Side Unit	- VMS Roadside Units (RSUs) shall have a 6-hour power backup that is supported by both raw power and renewable energy sources (solar panels). - The enclosure shall be weatherproof and meet the operating temperature requirements of all installed components. - The contractor shall provide all clamps, accessories, including the Line Interface Unit (LIU), data and

SL#	Technical Specification	Description
		power cabling, and the Power Junction Box/MCB. 4. The network switch shall be industrial-grade and have a minimum of 4 ports, including 2 SFP ports. 5. Solar panels, along with hybrid UPS (solar and raw power), and lithium-ion batteries shall be supplied to meet the minimum backup duration. 6. The solar panel backup capacity shall be calculated to account for all climatic conditions. The contractor shall provide all other necessary electronics, earthing, and surge protection.
Environmental Specifications		
7.4.2.2	Operating Temperature	-10°C to +55°C
7.4.2.3	Relative Humidity	Up to 95% (non-condensing)
7.4.2.4	Change of Temperature Test	IS 9000 Part XIV Sect. II
7.4.2.5	Dry Heat Test	IEC-571; IS: 9000 Part-III Sect 3
7.4.2.6	Cold Test	IS 9000 Part II Sect. III
7.4.2.7	Damp Heat Test (Cyclic)	IS 9000 Part V Sect. 2 Variant I
7.4.2.8	Damp Heat Test (Steady State Storage)	IS 9000 Part IV
7.4.2.9	Salt Mist Test	IS 9000 Part XI Procedure 3
7.4.2.10	Dust Test	IS 9000 Part XII
7.4.2.11	Bump Test	IS 9000 Part VII, Sec. 2

SL#	Technical Specification	Description
7.4.2.12	Vibration Test	TEC (IPT 1001A revised)

7.5 Technical Specification for OFC based digital Communication System

7.5.1 Optical Fiber Cable (OFC)		
Sl#	Parameter	Specification
7.5.1.1	OFC Cable OEM	The OFC Cable OEM shall be: Finolex/Aksh/Sterlite/HFCL or Equivalent ^{*2} .
7.5.1.2	Cable Type	Armoured Optical Fiber Cable should be procured from known brands.
7.5.1.3	Fiber Count	24 Cores
7.5.1.4	Fiber Type	G.652D or G.657A1/A2 ITU-T Recommendations
7.5.1.5	Fiber Attenuation	≤ 0.22 dB/km @ 1310nm; ≤ 0.18 dB/km @ 1550nm Maximum allowable attenuation values as per TEC standards
7.5.1.6	Chromatic Dispersion	≤ 17 ps/(nm·km) @ 1550 nm
7.5.1.7	Polarization Mode Dispersion (PMD)	≤ 0.2 ps/√km
7.5.1.8	Cable Construction	Loose Tube Design
7.5.1.9	Tube Material	PBT (Polybutylene Terephthalate) or equivalent
7.5.1.10	Filling Compound	Thixotropic gel or similar
7.5.1.11	Strength Member	Central Strength Member (FRP/Steel) & Aramid Yarn or equivalent surrounding tubes
7.5.1.12	Armour	Corrugated Steel Tape or Steel Wire Armouring
7.5.2 OFC Duct		
Sl#	Parameter	Specification
7.5.2.1	HDPE Duct	The HDPE Duct OEM shall be: Duraline/Finolex/Rockford or Equivalent *

² * Subject to prior approval before bid submission.

7.5.2.2	Material	High-Density Polyethylene (HDPE) Ensures durability and longevity in underground environments. Refer to relevant IS and TEC standards for HDPE material requirements.
7.5.2.3	Outer Diameter (OD)	40mm Nominal outer diameter, with specified tolerance as per TEC standards.
7.5.2.4	Inner Diameter (ID)	Around 33mm (typical) This will vary based on the wall thickness, which is a very important feature.
7.5.2.5	Wall Thickness	Typically 3.5mm (with allowable tolerances)
7.5.2.6	Internal Lubrication	Permanent solid lubricant layer co-extruded within the inner wall
7.5.2.7	Crush Resistance	Meets TEC requirements for crush resistance (specified in N/10cm)
7.5.2.8	UV Resistance	UV-stabilized material to prevent degradation from sunlight
7.5.2.9	Water Tightness	Designed to prevent water ingress
7.5.2.10	Marking	Clear and legible markings, including manufacturer's name, size, length, and relevant standards
7.5.2.11	TEC Compliance	Complies with the latest TEC Generic Requirements (GRs) for HDPE telecom ducts

7.6 Technical Specification of Control Room Equipment

SI#	Parameter	Specification
7.6.1	Central Servers (ATMS application Server & VIDES Server)	
7.6.1.1	Processor	Minimum latest generation Intel Xeon 16-Core processor 3.2 Ghz CPU, 64Bit, 19.25 MB Cache,

Sl#	Parameter	Specification
7.6.1.2	RAM	Minimum 128 GB RAM memory Shall be scalable, using DDR4 2666MHz DIMM (RDIMM) memory modules or latest.
7.6.1.3	Drive Bays	Minimum 12 bays to support SSDs for storage upgradation
7.6.1.4	Storage Capacity	Capacity based on 5-year data retention, but not less than 10 x 1.8TB SSD or More
7.6.1.5	SSD	Hot-swap disks of latest available speed;
7.6.1.6	Optical Drive	One DVD-RW drive
7.6.1.7	RAID Controller	RAID controller with 4GB Lithium-ion battery backed write cache (onboard or in a PCI Express slot); System Integrator to configure RAID-05
7.6.1.8	Network Adapters	3x10Gb port network adapter with advanced features and 1x10Gb port with loaded dual SFP+
7.6.1.9	Fibre Channel HBA	Dual 16GB single port PCIe Fibre Channel Host Bus Adapter with Optical Module
7.6.1.10	PCIe Slots	Minimum 6 PCIe Gen 3.0 x4 Slots
7.6.1.11	Power Supply	Redundant hot-plug
7.6.1.12	Cooling	Redundant hot-plug system fans
7.6.1.13	Display Controller	Support for VGA, HDMI, and DPI

Sl#	Parameter	Specification
7.6.1.14	Remote Management	Out-of-band remote management and maintenance capability via API and web-based GUI
7.6.1.15	Operating System	Licensed edition of Microsoft Windows Server OS latest version or Licensed Linux OS as recommended by bidder support for all industry-standard server software
7.6.1.16	Security	Trusted Platform Module (TPM)
7.6.1.17	MTTR	Less than 8 hours
7.6.1.18	MTBF	1,00,000 hours
7.6.2 Video Wall at Control Centre		
7.6.2.1	Video Wall Layout	The video wall controller shall support various monitor matrix geometries, although a 3x3 configuration is typical.
7.6.2.2	Video Wall Dimensions	The typical video wall display size shall be 3x2 meters or more.
7.6.2.3	Video Wall Input Sources	The video wall controller shall capture and display video from DVI, DisplayPort, VGA, and IP streaming sources.
7.6.2.4	Monitor and Bezel Size	1. The size of each Video Wall Monitor shall be 70" or higher 2. The Video wall cube/monitor shall be industrial grade to function 24x7 basis. 3. Monitors used in the video wall shall have bezel edge sizes less than 6 mm.

Sl#	Parameter	Specification
		4. The Video Wall Monitor shall be LED type or better suitable for a control centre system.
7.6.2.5	Integrated Video Wall Package	The video wall shall be an integrated package including control room display management software, a display controller (capable of handling at least 48 monitors), and slim bezel monitors.
7.6.2.6	Hot-Plugging and Redundancy	The video wall system shall support hot-plugging of monitors and have built-in redundancy.
7.6.2.7	Auto Calibration and Color Balancing	The video wall controller shall support automatic calibration and color balancing.
7.6.2.8	Monitor Mounting	Monitor mounts shall allow for easy replacement and hot-plugging.
7.6.2.9	Manufacturer Qualifications	The video wall manufacturer shall be a well-known company with a local presence, capable of providing 24/7 after-sales service and support.
7.6.2.10	Image Resizing and Positioning	Images displayed on the video wall shall be freely resizable and re-positionable.
7.6.2.11	Multi-Display as Single Screen	The video wall shall support multiple displays arranged in rows and columns, functioning as a single logical screen.
Video Wall Controller		

Sl#	Parameter	Specification
7.6.2.12	Processor	Intel core-i7 @ 3.4GHz or better
7.6.2.13	Memory	16GB or More
7.6.2.14	Hard Disk	2 x 500GB or more in RAID-1 supporting hot-plug and redundant
7.6.2.15	Ethernet	2 or more Gigabit Ethernet ports
7.6.2.16	Resolution	Support up to 32768 x 32768 pixel desktop
7.6.2.17	Graphic card(s)	Multichannel (4 or more) cards 2560 x 1600 @ 60Hz on DisplayPort and 1920 x 1200 @ 60 Hz on DVI
7.6.2.18	Video Inputs	DVI, DisplayPort, composite, RGB analog, IP Streaming, Wireless Streaming
7.6.2.19	Input Standards supported	PAL, NTSC, VGA, MPEG2, MPEG4, H.265 MJPG, V2D
7.6.2.20	Power supply	Dual 230V @ 50 Hz input redundant hot-swap compatible.
7.6.2.21	Form factor	19" Rack mount
7.6.2.22	OS	MS Windows or Linux with on-site support
7.6.3 Server for hosting third-party COTS Applications		
7.6.3.1	Processor	Minimum latest generation Intel Xeon 08-Core processor 2.1 Ghz or higher CPU, 64Bit
7.6.3.2	RAM	Minimum 32 GB RAM memory
7.6.3.3	Drive Bays	Minimum 6 bays to support SSDs for storage upgradation

Sl#	Parameter	Specification
7.6.3.4	Storage Capacity	Minimum 1 TB Raid Storage or higher
7.6.3.5	SSD	Hot-swap disks of latest available speed;
7.6.3.6	RAID Controller	Inbuild RAID Controller
7.6.3.7	Network Adapters	Minimum 2 x 1Gb port network adapter with advanced features
7.6.3.8	Cooling	Redundant hot-plug system
7.6.3.9	Display Controller	Support for VGA/HDMI/DPI
7.6.3.10	Operating System	Licensed edition of Microsoft Windows Server OS latest version or Licensed Linux OS as recommended by bidder support for all industry-standard server software
7.6.3.11	MTTR	Less than 8 hours
7.6.3.12	MTBF	1,00,000 hours
7.6.4 Video Recording and Incident Backup Server		
7.6.4.1	General Requirements	Recording capacity for minimum 180 days @ 25 FPS, according to camera resolution (02 MP and 04 MP) at 80% load. Contractor to propose storage capacity with 20% buffer.
7.6.4.2	Processor	Latest generation Intel Xeon 8-Core 3 GHz CPU or higher , 8 MB Cache.
7.6.4.3	Supporting ports	2-way audio. Inbuilt audio ports, 4xUSB Ports, DPI/HDMI Ports

Sl#	Parameter	Specification
7.6.4.4	Operating System Compatibility	Licensed edition of Microsoft Windows Server OS latest version or Licensed Linux OS as recommended by bidder support for all industry-standard server software
7.6.4.5	RAM	minimum 64 GB or higher.
7.6.4.6	Storage	Minimum 20 x 12 TB SSD/HDD bays, minimum 240 TB usable internal storage. RAID support. Expandable to 360 TB usable storage.
7.6.4.7	Network Interfaces	2 x 10 Gbps SFP+, 1 x 2.5 Gbps, 1 x 1 Gbps network adapters with advanced bandwidth management features.
7.6.4.8	Power Supply & Cooling	Redundant power supply.
7.6.4.9	Performance	Minimum 1200 Mbps read/write bandwidth for video recording.
7.6.4.10	Operating Temperature	Minimum -4.5°C to 35°C.
7.6.5 Video Analytics and Management Software (VAMS)		
7.6.5.1	Live/Recorded Video Viewing	The Video Analytics and Management System (VAMS) software shall be provided to view live and recorded video from all the cameras connected to local and wide area network.

SI#	Parameter	Specification
7.6.5.2	Architecture and Compatibility	The VAMS software shall have a client/server-based architecture. VAMS shall be configurable as a standalone system or with the client server running on any network-connected TCP/IP workstation. VAMS shall support a web client interface and shall operate without the requirement of software installation.
7.6.5.3	Licensing and System Status	The license for the total number of cameras of ATMS. The VAMS application shall be license free for the Client side to View the Live cameras and recording.
7.6.5.4	Audit Trail	The VAMS system shall record an audit trail of user logins, alarms generated, Setting changes, video/recording viewed, and exported video.
7.6.5.5	Storage Configuration	The VAMS shall allow configuration of recording drives, including local drives, direct attached storage drives.

Sl#	Parameter	Specification
7.6.5.6	Mobile Application Support	VAMS shall support mobile applications for both iOS and Android, capable of viewing multiple simultaneous live video streams and playing recorded video streams.
7.6.5.7	Open Architecture	The VAMS software shall have an open architecture supporting all IP cameras and encoders from multiple manufacturers, providing high-resolution megapixel features.
7.6.5.8	Multi-Console Viewing and Video Push	Multiple consoles/workstations shall simultaneously view live and recorded video/audio. Storage/video servers shall simultaneously provide live and recorded video to multiple consoles. Operators shall be able to push video to another operator console seamlessly.
7.6.5.9	Multi-Streaming and Remote User Access	The VAMS shall be capable of multi-streaming on all connected workstations/consoles and support a minimum of 20 simultaneous remote users with full TMC operator functionalities.

Sl#	Parameter	Specification
7.6.5.10	Continuous Recording	Recording of all video transmitted to the VAMS shall be continuous, uninterrupted, and unattended.
7.6.5.11	Video Motion Detection Recording	The VAMS system shall have video motion detection recording, recording video when motion is detected within a region of the camera's view.
7.6.5.12	Inactivity Timeout	Inactivity timeout feature shall be provided to save the bandwidth.
7.6.5.13	Alarm/Alert and Failover	VAMS shall automatically generate alarms/alerts in case of video loss or failure and shall have failover/redundancy features without manual intervention.
7.6.5.14	Event-Action Configuration and Analytics	The VAMS software shall connect events (input triggers, etc.) to desired actions (recording, alarms). It shall recognize event types like video motion, loss, input trigger, health monitoring, IP camera connection, software trigger, analytics, camera preview style, hovering, server disconnect, archive alarm and shall provide search and display analytic meta data when searching analytic event linkages.
7.6.6 Network Management System (NMS)		

Sl#	Parameter	Specification
7.6.6.1	Third-Party COTS Solution	The Network Monitoring System (NMS) must be a commercially available, off-the-shelf solution from a third-party vendor. It should be capable of monitoring all network devices installed within the System.
7.6.6.2	SNMP Integration	The NMS must integrate with network devices using SNMP protocols to gather health parameters and performance data.
7.6.6.3	Web-Based User Interface	The NMS must have a web-based user interface accessible via a public IP address and domain name for remote monitoring.
7.6.6.4	Dashboard	The user interface must include a dashboard with configurable widgets to display the status and health information of all ATMS devices. Widgets should be movable and resizable. The dashboard must also include filters for date, time, and specific devices.
7.6.6.5	Device Management	The user interface must allow users to add, remove, and modify devices. It should also have an auto-discovery feature to automatically detect and add network devices based on pre-configured settings.
7.6.6.6	Network Map	The NMS should be able to display a network map with either a fixed background image or a GIS-based map. Devices should be represented on the map with color-coded status indicators.
7.6.6.7	Fault Management	The NMS must have a dedicated screen for managing faults and downtime. It should allow users to view and track faults, and export fault reports.
7.6.6.8	SLA Reporting	The NMS should allow users to define Service Level Agreements (SLAs) for components and generate SLA reports viewable within the user interface.
7.6.6.9	Alerting	The system must generate sound, visual, and email alerts for fault occurrences and closures.
7.6.6.10	Downtime Reporting	The NMS should automatically calculate downtime reports based on device connectivity status. These

Sl#	Parameter	Specification
		reports must be accessible through the user interface.
7.6.6.11	Device Health Parameters	NMS shall collect the following minimum health parameters from the network devices:
		Device typeParameters
		Server /LPU /WorkstationsSNMP based integration with the OS of LPU (Windows or Linux) Hardware Parameters: CPU Usage, RAM usage, Storage level, CPU temperature, GPU temperature, Disk performance etc. Network: Communication status, ICMP response, packet drops etc.
		Network SwitchPort links status, sent and received bytes of ports, device up time, device availability
		FirewallNetwork speed, internet speed, number of connection, blocked connections etc.
		CamerasDevice availability, Camera CPU usage, camera fps, aspect ration, bit rate, serial number etc.
		Non-SNMP devicesConnection status, availability, ping response time, packet loss etc.
		7.6.7 Helpdesk & Inventory management System
7.6.7.1	COTS Model	The Helpdesk and Inventory system must be a commercial off-the-shelf (COTS) solution for managing fault logs and inventory reports.
7.6.7.2	Web-based Application	The system must be accessible via a web browser using a public IP address and domain name, with secure access limited to authorized personnel.

Sl#	Parameter	Specification
7.6.7.3	Ticket Management	The system must allow users to create tickets and assign them to specific staff members.
7.6.7.4	Ticketing Dashboard	A dashboard must display the status of tickets, including pending, closed, and parked tickets.
7.6.7.5	Fault Export	Users must be able to export a list of all faults from the system.
7.6.7.6	Stock Management	The system must track all devices, including serial numbers and other relevant details.
7.6.7.7	Stock Dashboard	A dedicated dashboard must provide an overview of all stock at the Control Room & Sites, with the ability to update device status (e.g., "Working," "Faulty").
7.6.7.8	Item Tracking	The system must track the status of all items (functional or faulty).
7.6.7.9	Stock Movement Tracking	The system must track the movement of items between locations.
7.6.7.10	Inventory Reports	The system must generate inventory reports as needed.
7.6.8 VoIP based IP Telephone Set		
7.6.8.1	Connectivity technologies	Dual switched auto-sensing 10/100 Mbps Ethernet
7.6.8.2	Call conference	Minimum 3 way
7.6.8.3	Special features	Layer 2 QoS (802.1Q, 802.1P) and Layer 3 (ToS, DiffServ, MPLS) QoS,
7.6.8.4	Display	Minimum 100 x 20 LCD display or bigger,
7.6.8.5	Headset	RJ9 headset jack (allowing EHS with Plantronics headsets)

Sl#	Parameter	Specification
7.6.8.6	Shortcut Keys	dedicated function shortcut keys for PHONEBOOK, HOLD, MUTE, HEADSET, TRANSFER, CONFERENCE, and REDIAL, SPEAKERPHONE, VOLUME.
7.6.8.7	Mounting	wall mountable, Dual switched auto-sensing 10/100 Mbps Ethernet ports
7.6.8.8	Phone Talk Time	45 A/W
7.6.9 Network-Attached Storage (NAS)		
7.6.9.1	CPU	Latest Intel or equivalent AMD Processor with fastest speed available in the market
7.6.9.2	On-board Memory	8 GB RAM or more as per requirement
7.6.9.3	Number of HDDs Supported	12x 2.5" or 3.5" SATA 6Gb/s, 3Gb/s hot swappable
7.6.9.4	HD Drive	As per system requirement
7.6.9.5	Host Interface	2x 4Gbps Fibre, 2x 1Gbps Copper and 2x 6Gbps SAS Ports
7.6.9.6	RAID Support	RAID levels 0, 1, 5, 5+, 6, 6+
7.6.9.7	NAS Storage	32 TB or More
7.6.9.8	Network Adapter	Dual-port 10GbE network expansion card
7.6.9.9	Network Transport Protocols	TCP/IP
7.6.9.10	Network File Protocols	CIFS, NFS, HTTP/HTTPS, FTP, NTP, SNMP, SMTP, DHCP and DNS

Sl#	Parameter	Specification
7.6.9.11	Drive Status /Space Monitoring	Supported
7.6.9.12	OS	MS Windows or Linux with on-site support
7.6.9.13	Power supply	Hot pluggable Redundant Power Supply
7.6.10 KVM Switch		
7.6.10.1	Ports	Minimum 8 Ports KVM
7.6.10.2	Connection	Display, Keyboard and Mouse
7.6.10.3	Video	1920x1440
7.6.10.4	LED	Indication for selected system and power led
7.6.10.5	Scan Interval	Within 5 Seconds
7.6.10.6	Switch Interval	Within 2 Seconds
7.6.10.7	Operating temp	-20 to 50 Degree
7.6.10.8	Warranty	Minimum 5 Years
7.6.11 Joy Stick for PTZ Camera		
7.6.11.1	Joystick Type	NETWORK PTZ KEYBOARD CONTROL
7.6.11.2	Display	INTERFACEINTERFACE Display LCD Screen
7.6.11.3	Joystick	4D Joystick
7.6.11.4	Protocols	TCP/IP, IPv4
7.6.11.5	Network	1xRJ45
7.6.11.6	Protocol	ONVIF
7.6.11.7	Buttons	Minimum 16 Nos
7.6.11.8	Working Environment	-10° ~ 55°C

Sl#	Parameter	Specification
7.6.11.9	Humidity	≤90% RH
7.6.12 Operator Workstation (Multi-Screen)		
7.6.12.1	CPU	Latest Intel Processor or AMD with fastest speed available in the market minimum i7 10 th Generation or above or equivalent in AMD)
7.6.12.2	Mother Board	Intel Original Mother Board
7.6.12.3	Memory	16 GB DDR RAM or more as per requirement
7.6.12.4	Hard Drives	1 TB SSD or more as per requirement
7.6.12.5	Video Card	2 Nos hardware accelerated for connecting 2 monitors in extended screen mode.
7.6.12.6	Network Adapter	Integrated 10/100/1000 Base –T
7.6.12.7	Sound Card	Built-in
7.6.12.8	Disk writer	CD, DVD and Blu Ray (Internal or External)
7.6.12.9	Monitor/Keyboard/Mouse	21" LED Multiscreen Monitor (Minimum 2 Nos) along with monitor stand and fixing components.
		Wireless Multimedia Keyboard
		Wireless Optical mouse
7.6.12.10	OS	MS Windows OS Latest version at the time of tender
7.6.12.11	Anti-Virus Software	Latest software at the time of tender

Sl#	Parameter	Specification
7.6.13 Server Rack		
7.6.13.1	Basic Structure	Frame of sturdy 1.5mm frame section construction, consisting of multi folded rolled hollow frame section punched in 25 mm DIN pitch pattern. All profile edges are radiused. The corners are stiffened with welded zinc die cast corner connectors, gland plates in 3 parts, which are removable and interchangeable.
7.6.13.2	Doors	1.5mm sheet steel perforated with foamed seal polyurethane gasket, rod type 3 point lock system and double bit inserts to DIN 43668 (with single door: hinge fitting r/h or l/h freely selectable on site) Hinges with captive hinge pins, door opening angle 130 to VDI, , pair of depth rails (73 x 23 mm rails) fitted with swivel spring load lock handles.
7.6.13.3	Rear Door	1.5mm sheet steel perforated Door.
7.6.13.4	Roof Panel	With foamed -on seal, removable. Vented roof plate with option of having cable entry provision from top.
7.6.13.5	Required Accessories	Floor standing rack, Front and rear perforated doors, screw fixed side

Sl#	Parameter	Specification
7.6.13.6		panels, top and bottom covers with cable entry Swivel handles on front and rear doors
7.6.13.7	Standard Mounting	Caster wheels (2 with Brake & 2 without Brake)
7.6.13.8	Ventilation	The rack shall have proper exhaust / ventilation using at least 4 fans housing units on top of the rack
7.6.13.9	Mounting Kit	Should have Four pkt of 20 nos. each Hardware mounting kit
7.6.13.10	Cable manager	Four nos. of 01U Horizontal covered PVC Cable manager
7.6.13.11	Power Distribution	Two nos. of PDU 12 Point (5/15 amp) with MCB
7.6.13.12	Rack Trays	Two nos. of Fixed Hardware Shelf
7.6.13.13		
7.6.14 Fibre Optical Network Switch With 24 SFP port		
7.6.14.1	Switch Type	Layer-3 Managed
7.6.14.2	Ports	Minimum 20 Port 10GB Fiber ports and 4 10GB LAN Ports
7.6.14.3	Environmental Rating	IP30 rated, operational up to 60°C in a sealed enclosure
7.6.14.4	Throughput	Up to 214 Mbps
7.6.14.5	Switching Capacity	288 Gbps or higher
7.6.14.6	Security Features	Port security, DHCP snooping, Dynamic ARP inspection, IP source guard, BPDU guard, spanning tree root guard

Sl#	Parameter	Specification
7.6.14.7	IPv6 Support	IPv6 certified/ready
7.6.14.8	Security Certification	Switch/OS tested and certified or in process of certification for EAL 2/NDPP or above under Common Criteria Certification
7.6.14.9	Power Supply	1:1 redundant internal power supply; hot-swappable power supply modules, fan modules, and transceiver modules
7.6.14.10	Ethernet Standards	IEEE 802.1D, 802.1s, 802.1w, 802.1x, 802.3ad, 802.3x, 802.1p, 802.1Q, 802.3, 802.3u, 802.3ab, 802.3z, 802.3az
7.6.14.11	Wire Rate Performance	Yes
7.6.15 Layer-3 manageable Network Switch with 24 Gbe ports		
7.6.15.1	Switch Type	Layer-3 Managed
7.6.15.2	Ports	24 x 10/100/1000 Base-T ports; 4 x SFP uplink ports with MMF modules; dedicated stacking ports
7.6.15.3	Environmental Rating	IP30 rated, operational up to 60°C in a sealed enclosure
7.6.15.4	Throughput	Up to 214 Mbps
7.6.15.5	Switching Capacity	288 Gbps
7.6.15.6	Standards Compliance	IEC 60068-2-6, IEC 60068-2-27, IEC 60068-2-47, IEC 60068-2-64, IEC 61000-4-5, NEMA TS-2

Sl#	Parameter	Specification
7.6.15.7	Security Features	Port security, DHCP snooping, Dynamic ARP inspection, IP source guard, BPDU guard, spanning tree root guard
7.6.15.8	IPv6 Support	IPv6 certified/ready
7.6.15.9	Security Certification	Switch/OS tested and certified or in process of certification for EAL 2/NDPP or above under Common Criteria Certification
7.6.15.10	Power Supply	1:1 redundant internal power supply; hot-swappable power supply modules, fan modules, and transceiver modules
7.6.15.11	Ethernet Standards	IEEE 802.1D, 802.1s, 802.1w, 802.1x, 802.3ad, 802.3x, 802.1p, 802.1Q, 802.3, 802.3u, 802.3ab, 802.3z, 802.3az
7.6.15.12	Wire Rate Performance	Yes
7.6.15.13	Stacking Bandwidth	128 Gbps dedicated
7.6.16 Manageable Network Switch with 8 ports		
7.6.16.1	Functionality	Provide continuous power to PoE equipment to meet performance, quality, and reliability needs.
7.6.16.2	Switch Type	Manageable 8-port industrial grade switch.
7.6.16.3	Ports	Minimum 8 x 10/100Base-T ports (with at least 6 PoE ports).
7.6.16.4		PoE power budget of 60W.

Sl#	Parameter	Specification
7.6.16.5	Environmental Rating	IP30 rated
7.6.16.6	Operating Temperature	Up to 60°C in a sealed enclosure
7.6.16.7	Mounting	DIN rail mountable
7.6.16.8	Compliance	IEC 60068-2-6, IEC 60068-2-27, IEC 60068-2-47, IEC 60068-2-64, IEC 61000-4-5, and NEMA TS-2 compliant.
7.6.17 LaserJet Colour A3 Printer (MFP)		
7.6.17.1	Type	Color Laser Multi-Function Printer (MFP)
7.6.17.2	Functions	Print, Copy, Scan, Fax (Optional)
7.6.17.3	Duty Cycle	Minimum 40,000 pages/month)
7.6.17.4	Control Panel	Color Touchscreen or Button based including display.
7.6.17.5	Print Speed (A4)	Minimum 25 ppm in Color and Black & White
7.6.17.6	Print Speed (A3)	Minimum 15 ppm in Color and Black & White
7.6.17.7	First Print Out Time	Less than, 10 seconds) in Color and Black & White
7.6.17.8	Warm-up Time	Less than 30 seconds) from power on
7.6.17.9	Copy Speed (A4)	Minimum 25 cpm in Color and Black & White
7.6.17.10	Copy Speed (A3)	Minimum 15 cpm in Color and Black & White
7.6.17.11	Reduction/Enlargement	25% - 400%

Sl#	Parameter	Specification
7.6.17.12	Multiple Copies	1 to 999)
7.6.17.13	Scan Type	Color Flatbed and ADF (Automatic Document Feeder)
7.6.17.14	ADF Capacity	Minimum 50 sheets
7.6.17.15	Scan Speed	Minimum 40 ipm in Color and Black & White
7.6.17.16	Scan Resolution	Optical: Minimum, 600 x 600 dpi, Interpolated: 9600 x 9600 dpi
7.6.17.17	Scan Destinations	Scan to Email, Scan to Folder (SMB/FTP), Scan to USB, Scan to PC
7.6.17.18	File Formats	PDF, JPEG, TIFF, etc.
7.6.17.19	Duplex Scanning	Automatic A4 and A3 Duplex Scanning
7.6.17.20	Interface	Standard: USB 2.0, Ethernet (10/100/Base-T)
7.6.17.21	Network Protocols	TCP/IP, etc.
7.6.17.22	Additional	Mobile app and email printing supported
7.6.18 LaserJet B/W A4 Printer (MFP)		
7.6.18.1	Printing speed	Up to 33 ppm (normal quality mode)
7.6.18.2	First page out	Not more than 8 second
7.6.18.3	Print resolution	Up to 1200 x 1200 dpi
7.6.18.4	Monthly duty cycle	Up to 50,000 pages
7.6.18.5	Print language	PCL 6, PCL 5c
7.6.18.6	Paper trays	2 (standard)
7.6.18.7	Media size	A4

Sl#	Parameter	Specification
7.6.18.8	Duplex (both sides) printing	Automatic
7.6.18.9	Connectivity	USB 2.0, 10/100/1000 Ethernet
7.6.19 10 KVA UPS in hot standby mode with Lithium-ion battery		
7.6.19.1	Rated Power	10 KVA
7.6.19.2	Technology	i) True online rack mountable IGBT based UPS with double conversion technology.
7.6.19.3		ii) UPS should be capable of paralleling up to 2 units or better .
7.6.19.4		iii) UPS should have IGBT based rectifier and inverter.
7.6.19.5		iv) Advance battery management feature should be built in for prolonged battery life
7.6.19.6		v) The UPS should be compatible for single phase input and single-phase output supply.
7.6.19.7	Input	i) Voltage range 110 -275 V, Load dependent ,1 Ph,380v AC3 Phase
7.6.19.8		ii) 45-55Hz / 54-66Hz (extendable to 40~70HZ when load < 60%)
7.6.19.9		iii) Power Factor 0.99 (With PF correction)
7.6.19.10		iv) Capacity 10 KVA /10KW
7.6.19.11	Output	i) Voltage range 220 /230/240 VAC +/- 2%
7.6.19.12		ii) Harmonic distortion <3% (Linear Load); <5%(Nonlinear load)
7.6.19.13		iii) 45-55Hz / 54-66Hz (extendable to 40~70HZ when load < 60%)

Sl#	Parameter	Specification
7.6.19.14		iv) Power Factor Unity
7.6.19.15		v) CREST factor 3:1
7.6.19.16	Efficiency	95% @ 230V output with typical load (Line mode with battery full charged)
7.6.19.17	Battery	i) Type - Lithium Ion
7.6.19.18		ii) Backup Time - 04 hours in parallel mode
7.6.19.19		iii) Transfer Time - Zero
7.6.19.20	Display	Multi-language LCD + status LED
7.6.19.21	Interface slot	USB & Intelligent Slot (SNMP)
7.6.19.22	Protection Grade	IP 20
7.6.19.23	Auto shutdown Software	UPS should come with Auto shutdown and monitoring software in CD media
7.6.19.24	Credentials	i) Manufacturer should be ISO 9001: 2000 certified
7.6.19.25		ii) Manufacturer should be ISO 14001 certified
7.6.19.26		iii) UPS should meet ROHS standards
7.6.19.27	Warranty	UPS Should have 05 years Onsite warranty and Batteries should have at least 02 years Onsite warranty
7.6.19.28	Surge Regulations	IEC 61000-4-5 Level 4
7.6.19.29	Parallel Cable component	For running UPS in parallel
7.6.20 75" LED Smart TV for VIDES		
7.6.20.1	Display Size	75 Inch
7.6.20.2	TV Type:	Smart TV
7.6.20.3	Connection	Network/Wifi Connection

Sl#	Parameter	Specification
7.6.20.4	Screen share	Wireless Screen Cast
7.6.20.5	Resolution	High Resolution 3,840 x 2,160
7.6.20.6	Panel	IPS
7.6.20.7	Brightness	500 cd/m2
7.6.20.8	Lifetime	40,000 Hrs or longer
7.6.20.9	Operation	Portrait and Landscape
7.6.20.10	Ports	VGA/HDMI/DP
7.6.21 Firewall		
7.6.21.1	Firewall Throughput	4/4/4 Gbps or Higher
7.6.21.2	(1518/512/64-byte UDP)	64 Byte
7.6.21.3	Firewall Latency	3 Micro Sec or better
7.6.21.4	New sessions /Sec	30,000 or Higher
7.6.21.5	Firewall Policies	5,000 or Higher
7.6.21.6	IP Sec VPN Throughput	2.5 Gbps or better
7.6.21.7	Max G/W to G/W IPSEC Tunnels	200 or better
7.6.21.8	Max client to G/W IPSEC Tunnels	2500 or better
7.6.21.9	SSL VPN Throughput	200 Mbps or better
7.6.21.10	SSL Inspection throughput	135 Mbps or better

Sl#	Parameter	Specification
7.6.21.11	Application control throughput	900 Mbps
7.6.21.12	Concurrent sessions	1.3 million or higher
7.6.21.13	IPS throughput	450 Mbps or better
7.6.21.14	Local storage	128 GB or more
7.6.21.15	Interfaces (FE, GE Ports)	14 x GE RJ-45 or better
7.6.21.16	Advanced Threat Prevention System	must be provided
7.6.21.17	Support and License	05 years 24x7 UTM Security Bundle
7.6.22 50 KVA Servo Stabilizer		
7.6.22.1	Capacity	50 KVA
7.6.22.2	Input Voltage Range	Range 1: 310 V-480 V
7.6.22.3	Output Voltage Range	380 to 415 V AC
7.6.22.4	Input Frequency	47-53 Hz
7.6.22.5	Control Type	Digital-Micro controller based
7.6.22.6	Correction Speed	16.6 to 70V / Sec
7.6.22.7	Reset	Manual / Auto Reset with time delay and programmable
7.6.22.8	Protections	A) Electronic over & under voltage trip with time delay for input & output

Sl#	Parameter	Specification
7.6.22.9		B) Electronic overload protection and short circuit.
7.6.22.10		C) Phase reversal protection and cut off
7.6.22.11		D) Single phase prevention and cut off
7.6.22.12		E) Neutral failure protection
7.6.22.13		F) Frequency cut off protection
7.6.22.14		G) Earth neutral voltage cut off protection
7.6.22.15	Audio Alarm	For tripping conditions
7.6.22.16	Panel LED	LED indication for overload and normal condition
7.6.22.17	Provision of Cabling	Input and Output terminations with provisions for fixing cable glands
7.6.22.18	Operating Temperature	0-45°C
7.6.22.19	Related Standard	IS 9815
7.6.23 Biometric attendance system with door Access Control System		
7.6.23.1	Locking unit	600 Lbs
7.6.23.2		Electro Magnetic Lock:
7.6.23.3		high-strength electromagnetic lock ensures secure locking of the door when activated..
7.6.23.4	Controller	Indoor Access controller, single unit for Building. along with management software

Sl#	Parameter	Specification
7.6.23.5		Should support the registration up to 300 Staff or more.
7.6.23.6	Power Supply Unit	The power supply unit shall supply the necessary electrical power to operate the components of the access control system, ensuring continuous functionality.
7.6.23.7	Unlock Button (Push button type)	This unlock button inside the room to allow authorized individuals to release the door lock manually, providing an additional means of entry or exit when needed.
7.6.23.8	Biometric System Type	Networked/Standalone Biometric Access Control System
7.6.23.9	Verification Method	Fingerprint or Facial Recognition.
7.6.23.10	User Capacity	Minimum 100 users
7.6.23.11	Transaction Capacity	Minimum 10,000) transactions
7.6.23.12	Identification Time	Less than 2 second)
7.6.23.13	False Acceptance Rate (FAR)	Less than 0.001%
7.6.23.14	False Rejection Rate (FRR)	Less than 0.01%
7.6.23.15	Communication Interface	TCP/IP or RS485
7.6.24 Control Room Workstation		

Sl#	Parameter	Specification
7.6.24.1	CPU & Chipset	Intel Core i7 10 th Gen or higher
7.6.24.2		Quad Core ,
7.6.24.3		6 MB Cache,
7.6.24.4		up to 3.60 Ghz w/Turbo Boost) or better
7.6.24.5	Memory	16 GB (1X16 GBoR 2 X 8 GB) DDR4 Synchronous Dynamic Random Access Memory
7.6.24.6	Storage	1TB SSD storage
7.6.24.7	Display	21 inch/ EPEAT Silver/energy star/ Minimum 1366x768 resolution/LED Backlit/power consumption 15W/
7.6.24.8	Keyboard	104 Keys
7.6.24.9	Mouse	Optical with USB interface
7.6.24.10	Ports	Serial Connector/RJ-45 Network Connector/(2) USB 3.0 Ports with Wake from S4/S5 feature/Line-In Audio Connector/PS/2 Mouse Connector/Line-Out Connector for powered audio devices/(4) USB 3.0 Ports/VGA Monitor Connector/(2) DisplayPort Monitor Connectors/PS/2 Keyboard Connector/Hard Drive Activity Light/5.25-inch Half-Height Drive Bay (behind bezel)/Microphone/Headphone Connector/USB 2.0 Fast Charging (powered) Port (black/Headphone Connector
7.6.24.11	Graphic Card	Should have 2GB dedicated Graphic Card
7.6.24.12	OS	Windows latest OS enterprise edition
7.6.24.13	Mandatory Software	Microsoft Word with Perpetual License of latest version

Sl#	Parameter	Specification
7.6.24.14	MTTR	2 Hours
7.6.25 NVR 48 channel		
7.6.25.1	Channels Supported	48
7.6.25.2	CPU	Latest Intel Processor with fastest speed available in the market
7.6.25.3	Flash	512Mb (DOM)
7.6.25.4	LED Indicators	Status, LAN, eSATA, 10GbE
7.6.25.5	Display	LCD or Better
7.6.25.6	Number of HDDs Supported	8 x 3.5-inch SATA ; SATA 6Gb/s (backward compatible with SATA 3GB/s)
7.6.25.7	HDD Capacity	Minimum 32 TB or more as per requirement
7.6.25.8	HD Drive	As per system requirement
7.6.25.9	Disk Swap	Hot Swap support
7.6.25.10	RAID Support	RAID levels 0, 1, 5, 5+, 6, 6+
7.6.25.11	Gigabit LAN port	4
7.6.25.12	Recording Modes	Continuous, Scheduled, Manual, Alarm
7.6.25.13	Pre-event and Post event Recording	Up to 300 seconds pre and post
7.6.25.14	Audio	Audio recording supported
7.6.25.15	Maximum Resolution Supported	Full HD 1080P (HDMI/VGA output)

Sl#	Parameter	Specification
7.6.25.16	Drive Status /Space Monitoring	Supported
7.6.25.17	OS	MS Windows or Embedded Linux with on-site support
7.6.25.18	Power supply	Hot pluggable Redundant Power Supply
7.6.25.19	MTBF	15000 Hours
7.6.26 CCTV Dome Camera		
7.6.26.1	Purpose	Building Surveillance Dome camera for Indoor
7.6.26.2	Camera Type	2MP, 25 FPS, PoE powered, bullet type
7.6.26.3	FPS (Frames Per Second)	2 MP 25 FPS
7.6.26.4	Camera Type	PoE Powered Dome Type
7.6.26.5	IR Range	30 meters inbuilt
7.6.26.6	Illumination	0.01 lux for color image, 0 lux for B/W with IR
7.6.26.7	Lens	2.8 mm fixed focal
7.6.26.8	Image Enhancement	DWDR (120 dB), 3D DNR, BLC, HLC, Defog, AGC
7.6.26.9	Streaming	Dual simultaneous streaming
7.6.26.10	SD Card Slot	Inbuilt SD card slot
7.6.26.11	SD Card	At least 128 GB Class 10 SD card Included
7.6.26.12	Shutter Speed	1/3 second to 1/100000 seconds
7.6.26.13	Housing	IP67 rated, IK10 protection
7.6.26.14	Microphone	Built-in Microphone

Sl#	Parameter	Specification
7.6.26.15	Event Detection	Motion detection, intrusion detection, line crossing detection, tampering detection
7.6.26.16	ONVIF	ONVIF
7.6.26.17	Compression	H.265
7.6.26.18	Bit Rate	128 kbps ~ 6 Mbps
7.6.26.19	Protocol Support	TCP/IP, UDP, HTTP, FTP, IPv4, RTSP, UPnP
7.6.27 CCTV Bullet Camera		
7.6.27.1	Purpose	Building Surveillance Bullet camera for Outdoor
7.6.27.2	Camera Type	2MP, 25 FPS, PoE powered, bullet type
7.6.27.3	Lens	2.7-13.5mm motorized varifocal lens
7.6.27.4	IR Range	30 meters
7.6.27.5	Minimum Illumination	0.01 lux (color), 0 lux (B/W with IR)
7.6.27.6	Image Enhancement	True WDR (120dB), 3D DNR, BLC, HLC, Defog, AGC
7.6.27.7	Video Streaming	Triple simultaneous streaming
7.6.27.8	Storage	Built-in SD card slot (minimum 128GB Class 10 SD card included)
7.6.27.9	Shutter Speed	1/3 second to 1/100000 seconds
7.6.27.10	Housing	IP67 rated,
7.6.27.11	Audio	Built-in microphone for audio recording
7.6.27.12	I/O Ports	One alarm I/O port

Sl#	Parameter	Specification
7.6.27.13	Intelligent Analytics	Motion detection, intrusion detection, line crossing detection, tampering detection
7.6.27.14	Event Handling	Records events on SD card
7.6.27.15	ONVIF Support	ONVIF
7.6.27.16	Video Compression	H.265
7.6.27.17	Video Bit Rate	128 kbps ~ 6 Mbps
7.6.27.18	Network Protocols	TCP/IP, UDP, HTTP, FTP, IPv4, RTSP, UPnP

7.7 Technical Specification of MRCS

Category	Item	Specification
7.7.1 System Overview		
7.7.1.1	Scope	Wireless communication between ATMS Control Centre, Vehicle Mounted Units, and Handheld units for emergency response and routine Operations & Maintenance.
7.7.1.2	Vehicle Mounted Units	Fitted on ambulances, cranes, and patrolling vehicles for instant communication while moving.
7.7.1.3	Handheld Units	Required for maintenance activities on the highway.
7.7.1.4	Communication Flow	Units shall communicate with ATMS Control Centre and amongst themselves.
7.7.1.5	ATMS Control Centre	Shall have base/repeater Stations, control equipment, and a voice logger for recording all communication.
7.7.2 General Requirements		
7.7.2.1	Highway Area Coverage	99% coverage reliability of a minimum 95%.
7.7.2.2	Communication Quality	Crystal clear, static-free communication even for vehicles moving at high speeds.
7.7.2.3	Technology	Based on state-of-the-art Digital technology.

Category	Item	Specification
7.7.2.4	Mixed Mode Operation (Desirable)	Ability to operate in mixed (analog and Digital) mode for additional flexibility.
7.7.2.5	Design	Modular design for quick diagnosis and efficient onsite maintenance.
7.7.2.6	Interference	Shall not induce radio interference to other telecom equipment, nor be susceptible to interference from adjacent mounted radio equipment.
7.7.2.7	Unit Addressability	Each unit shall be uniquely addressable, preferably ESN validated.
7.7.2.8	Integration	Mobile Radio base station unit at ATMS control center shall seamlessly integrate with co-located Emergency Response integrated audio communication unit.
7.7.3 Technical Requirements		
7.7.3.1	Component Grade	All components shall be of industrial grade specification.
7.7.3.2	Standards & Protection	Shall conform to ETS European standards and be suitably protected through shielding/grounding against external EMI/ESI Interference, and be immune to RFI, ESD and lightning.
7.7.4 Repeater/Fixed Base Station		

Category	Item	Specification
7.7.4.1	Controller	Base unit shall include a controller for switching and control function.
7.7.4.2	Inter-repeater Connection	Base unit shall connect to other repeaters if needed.
7.7.4.3	Logging & Accumulation	Base unit shall have call logging and airtime accumulation facility.
7.7.4.4	Configuration	Configurable through installed software on a locally connected computer or over a TCP/IP link.
7.7.4.5	PSTN Interface	Capability to interface with Public Switched Telephone Network (PSTN) for remote access and Mobile/Handheld to telephone calls and vice versa.
7.7.4.6	Programming Security	Not possible to program repeaters without a hardware security lock.
7.7.4.7	Display	Field unit shall have an alphanumeric display.
7.7.5 Handheld/Vehicle Mounted Radio		
7.7.5.1	GPS Integration	Vehicle mounted radio shall support integration of GPS.
7.7.5.2	Programming Security	Not possible to program the radios without software security key.
7.7.5.3	Data Messaging Capability	Radios shall have Data Messaging Capability and facility to receive and send pre-defined status messages (at least 12 Character Messages).

Category	Item	Specification
7.7.5.4	Address Storage	Radios shall have the facility to store at least 24 addresses.
7.7.5.5	Selectable Status Messages	At least 16 status messages shall be selectable for sending to other radios.
7.7.5.6	Caller Identification	Caller shall be identifiable through display of the PIT ID on the receiving radio.
7.7.5.7	Short Message Reception	Radios shall have the capability to receive Short Messages (at least 40 Characters) from a Control centre.
7.7.5.8	Memory for Messages	Radios shall have enough memory to store minimum 6 received Status messages along with sender's ID and 2 Short Messages along with sender's ID.
7.7.6 General Requirements		
7.7.6.1	Call Types	Support broadcast calls of a group call or an Individual Call.
7.7.6.2	Link Establishment	Possible to establish ATMS to field unit, field unit to ATMS, or field unit to field unit links.
7.7.6.3	Integration	Mobile radio system shall be integrated via the Fiber optic communication system.
7.7.6.4	Call Management	Facilities for waiting calls, holds calls, and transfer calls.
7.7.6.5	Call Queuing	Call queuing supported if all communication paths/channels are busy.

Category	Item	Specification
7.7.6.6	Priority Levels	Shall support multiple priority levels with pre-emption.
7.7.6.7	Field Unit Call Termination	Field unit to field unit calls shall auto-terminate if either party hangs up, ATMS control centre initiates a call to one party, or conversation exceeds 5 minutes.
7.7.6.8	PSTN Bridging	Possible to bridge the regular PSTN network to the mobile radio network in emergencies.
7.7.6.9	Simultaneous Calls (Base Unit)	Base unit at ATMS control center shall be capable of processing at least 3 calls simultaneously.
7.7.6.10	Emergency Messaging	Possible to exchange quick, short, status/alarm messages in case of emergency.
7.7.6.11	Voting System	Suitable voting system to select the better signal at base stations as well as mobile units.
7.7.6.12	Redundancy	Selection, positioning, planning, and installation of equipment shall ensure localized failure does not collapse entire communication; redundant paths shall ensure near total coverage.
7.7.6.13	Frequency Usage	System shall use frequencies obtained by ATMS Service Provider from WPC.
7.7.6.14	Power Supply Protection	System shall be protected against any damage due to power supply fluctuations, transients and surges.

Category	Item	Specification	
7.7.7 Frequency & Power Output Specifications			
7.7.7.1		UHF	800 MHZ
7.7.7.2	Frequency Band	400-430 MHz	806-825 MHZ base Station Rx
		450-480 MHz or 480-512 MHz	851-870 MHz Base Station TX
7.7.7.3	Power Output		
7.7.7.4	Maximum power output of Base station/Repeater with Power amplifier	80 Watt,	100 Watt
7.7.7.5	Mobile	UHF: 5-15 Watt , 800 MHZ: 30 Watt	
7.7.7.6	Hand held terminal	UHF: 5 Watt , 800 MHZ: 3 Watt	
7.7.7.7	Analog	UHF:12.5 KHz 800 MHZ: 25 KHz	
7.7.7.8	Digital	UHF: 6.25 KHz 800 MHZ:12.5 KHz	
7.7.7.9	Duplex Spacing	UHF: 45 MHz , 800 MHZ: 10 MHz	

7.8 Technical Specification of Emergency Roadside Telephone System

Sl#	Category	Specification
7.8.1	System Definition	The term "Emergency Roadside Telephone" or "Phone" encompasses the phone instrument, mounting hardware, pole or other mounting structure, grouting, charging stations, secondary power sources like batteries, and solar modules if used.
7.8.2	Installation	The system is recommended for installation every 2 kilometers on all access-controlled highways and hilly roads. The requirement for other highways will be assessed by NHAI.
7.8.3	Primary Function	To be used by road users for making emergency calls to the local ATMS Control Centre to report incidents needing immediate help.
7.8.4	Network & Communication	Must be suitable for operation on a Fibre Optic, dedicated copper, or wireless transmission network. The phones must operate in duplex mode.
7.8.5	Hardware	Must include a built-in speaker and microphone for hands-free operation.
7.8.6	Physical Interface	A clearly labeled and distinctly identifiable "activate" button is required to start communication. The front fascia must be suitable for rugged outdoor use.
7.8.7	User Operation	A user initiates a call by pushing the call button. If the call is successfully initiated, the user will hear a ring tone.
7.8.8	Call Status Indicators	Must provide audio and visual indications for call status, including call placed, call acknowledged at the control center, call in progress, or call on hold.
7.8.9	Call Handling (Busy Lines)	At least three numbers must be programmed into the device. The unit will automatically dial each number in sequence until the line connects or the user cancels the call. If all lines are busy, a busy tone will sound, accompanied by a voice message in English, Hindi,

		and the local language. A feature to record a message must be available if all lines are busy.
7.8.10	System Failure Notification	When the system is not working, a specific message will sound along with a tone that is different from the ring or busy tone.
7.8.11	Power Supply	Must have a provision to operate during a primary power failure. A battery-backed power source is required and should preferably be solar-charged.
7.8.12	Power Restoration	The system must have an automated start-up capability after a power outage and restoration.
7.8.13	Self-Diagnostics	The phone units must have self-diagnostics to test for correct operation. Any detected malfunction and its nature must be reported immediately to the control room system.
7.8.14	Scheduled Testing	A scheduled test of the speaker and microphone for all phone units must be performed at regular intervals.
7.8.15	Data Logging	All alarms, results of self-diagnostic tests, and other system-related data must be logged to a central database.
7.8.16	Security	Any attempted damage detected by the anti-tampering sensor must be recorded separately for quick access.

8 SYSTEM TESTING AND ACCEPTANCE

8.1 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.

- 8.1.1 Quality systems relating to the design, development, testing, supply and maintenance of software shall implement the guidance of ISO 9000-3.
- 8.1.2 The Service provider shall operate an Environmental Management System complying with the requirements of ISO 14001.
- 8.1.3 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.
- 8.1.4 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.
- 8.1.5 The ATMS equipment shall provide reasonable access and facilities for the NWPPL/NEPPL to audit the operation of its quality systems and test facilities as deemed necessary by the NWPPL/NEPPL.
- 8.1.6 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.

- 8.1.7 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), System Acceptance Tests (SAT) and System Integration Tests (SIT). All costs for such tests shall be borne by the service provider.
- 8.1.8 All test equipment shall have a valid calibration certification.
- 8.1.9 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.
- 8.1.10 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 NWPPL/NEPPL 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 NWPPL/NEPPL unless specifically authorized in writing by NWPPL/NEPPL otherwise.
- 8.1.11 The NWPPL/NEPPL 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 NWPPL/NEPPL shall be given minimum seven (7) full business days' prior notification before rescheduling another test trial.
- 8.1.12 ATMS Equipment that fails to conform to the requirements of any test will be considered defective and the equipment will be rejected by the NWPPL. 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 NWPPL/NEPPL. 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 NWPPL/NEPPL prior to a new test date being scheduled.

- 8.1.13 In the event that the ATMS equipment malfunctions during the test period, the NWPPL/NEPPL 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.
- 8.1.14 If ATMS equipment has been modified or replaced as a result of a defect, a report shall be prepared and delivered to the NWPPL/NEPPL 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 NWPPL/NEPPL, develops, the NWPPL/NEPPL may direct that design and construction modifications be made to all similar units without additional cost to the NWPPL/NEPPL. In the case of problems common to many units, all units shall be modified at no additional cost to the NWPPL/NEPPL.
- 8.1.15 See relevant subsections below for a detailed description of each type of testing and what it involves.

8.2 Factory Acceptance Test:

- 8.2.1 The FAT shall be conducted prior to shipment on the prototypes of below-mentioned components to the project site. The FAT shall be conducted in the presence of the representative of Authority and consultant (team comprising up to 05 persons from various project locations) and shall verify that the equipment and systems meet the specified requirements and are fully operational. The System Integrator shall be required to perform a Factory Acceptance Test (FAT) for the following minimum Components:

- 1. Video Wall & Controller
- 2. All types of Cameras used in ATMS system

3. Radar System

4. Vehicle Actuated Speed Display

5. Fixed VMS & Portable VMS

6. Poles, Gantries and enclosures

7. Software–

- I. ATMS Central Software including all sub-systems
- II. Video Analytics & Management Software (VAMS) for Video Recording Server.
- III. NMS and Helpdesk and Inventory Management System

8.2.2 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.

8.2.3 The System Integrator shall provide detailed test procedures and results for review and approval by the Authority prior to at least 10 days before the FAT date. Successful completion of the FAT is a prerequisite for the shipment and installation of the equipment and systems at the project site. All costs associated with the FAT, including travel and accommodation for representative (s) of Authority, shall be borne by the System Integrator.

8.2.4 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.

8.2.5 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.

8.2.6 The factory acceptance test is used to:

- 1.** Provide proof of functionality, quality and integrity with a comprehensive checking process against the product specifications

2. Verify all-important documents (manuals, instructions, plans, drawings) to ensure they accurately reflect the requirements and the equipment operation
3. Ensure that the equipment performs as expected under the testable range of foreseeable conditions, including misuse and errors.

8.2.7 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.

8.2.8 One of the following actions shall be taken dependent on the extent of the fault:

1. 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.
2. 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.
3. 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.

8.2.9 In case of any item is found with major errors or failed to comply with RFP requirements, bidder may be required to replace all such component(s) with fully RFP compliant make & models without any cost implication to the client.

8.3 Installation Acceptance Test

8.3.1 Once the installation is completed, System Integrator shall call for the IAT to confirm the installation as per supplied quality and quantity. During the installation, the authority shall verify the installation of components ensuring all standards and compliance.

- 8.3.2 The IAT shall be undertaken at each ATMS equipment location to verify that it meets the requirements described in the detailed project design specifications.
- 8.3.3 Following the installation of equipment, but prior to the connection with other ATMS systems and subsystems, an IAT shall be conducted on each piece of equipment and witnessed by the NWPPL/NEPPL and/or the authorized representative.
- 8.3.4 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.
- 8.3.5 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.
- 8.3.6 Equipment installation shall be inspected to confirm compliance to equipment manufacturer's Installation good industry practice recommendations.
- 8.3.7 The ATMS equipment provider shall ensure that the required testing equipment, including a portable computer and test software is provided for the IAT.
- 8.3.8 If any ATMS equipment or ancillary component fails to pass the IAT, more than twice, same shall be replaced with new ATMS equipment or ancillary component of same make and model, and the IAT shall be conducted again until proven successful.
- 8.3.9 The IAT shall be conducted for each and every piece of ATMS equipment and ancillary components.
- 8.3.10 Time extensions shall not be granted to perform the IAT due to any failures. Failures during the IAT shall be resolved at no additional cost to the Client.

8.4 System Acceptance Test

- 8.4.1 The System Integrator shall execute the System Acceptance Test (SAT) when IAT is completed to confirm the specifications and standards prescribed in the respective RFP. The System Integrator shall connect the entire system with the network and integrate the software with all sub-systems to start the SAT. The ATMS system should be fully functional at the time of SAT.
- 8.4.2 System Integrator shall arrange the SAT of all hard and software installed for the ATMS system.
- 8.4.3 The SAT shall also incorporate the network-manageable portions of the ATMS system including the ATMS system interface to the Regional and Main Control centres. The SAT shall begin after earlier stages of testing have been successfully completed (i.e. FAT and IAT) and accepted by the Client and/or the nominated representative. When possible, the SAT shall be conducted during the harshest environmental period deemed for that particular equipment. The duration of the SAT will be agreed with the Client prior to starting.
- 8.4.4 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.
- 8.4.5 The SAT shall be re-started after the identified deficiency has been corrected.
- 8.4.6 If the total number of System Shutdowns exceeds three (3) due to the same system or subsystem, ATMS equipment, or ancillary component;
 - 1. The system, subsystem, ATMS equipment, or ancillary component shall be removed and replaced with a new and unused unit.

- 2.** All applicable FAT and IAT, as deemed necessary by the Client shall be performed and the SAT shall be restarted upon written approval from the Client.
- 8.4.7 Time extensions shall not be granted to perform the SAT due to any failures. Failures during the SAT shall be rectified at no additional cost to the Client.
- 8.4.8 Upon the successful completion of the SAT and all the required submittals, testing, training, and documentation have been successfully submitted to and approved, the Client shall provide written notice of Final Acceptance and System shall be considered as Commissioned.

9 SERVICE LEVEL AGREEMENT & SPARE PARTS

9.1 Service Level Agreements (SLA)

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.

9.1.1 **SLA Exclusion:** Penalties shall not be levied on the SI in the following cases:

9.1.1.1 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).

9.1.1.2 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".

9.1.1.3 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 NWPPL/NEPPL regarding the same.

9.1.2 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.

9.1.3 SLA Terms for Payment:

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,

9.1.3.1 The contractor will get 100% of the quarterly O&M value due for the period (as per the 'Payment clause 13.2 of this RFP) if all the baseline performance metrics are complied with and the cumulative credit points are 100.

9.1.3.2 The contractor will get lesser payment in case of lower performance.

The formula calculating the deductions is:

(100 – SLA Point Score) %).

Example: if SLA pointscore is 80 then the SI will get 20% less on the periodic O&M payment.

9.1.3.3 In case the overall performance is less than 50% in the quarter, no amount will be paid for the entire quarter.

9.1.3.4 In case the score falls below 50 for two consecutive quarters, the Authority can invoke the termination clause.

9.1.3.5 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 NWPPL/NEPPL for accuracy and reliability.

9.1.3.6 NWPPL/NEPPL 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 NWPPL/NEPPL on an annual basis after consulting the SI, Project Manager and other experts.

SI#	Performance Area	Scoring	Termination Trigger	Measurement Mechanism
1.	VIDES Automatic detection of all incidents 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. NWPPL/NEPPL may randomly audit videos collected under VIDES cameras to check this SLA.
2.	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. VIDES says wrong-lane driving but on manually checking video it is correct lane).

Sl#	Performance Area	Scoring	Termination Trigger	Measurement Mechanism
3.	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 $\geq 95\%$ 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 NWPPL/NEPPL.
4.	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 $\geq 95\%$ 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 NWPPL/NEPPL.
5.	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 detected 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.

Sl#	Performance Area	Scoring	Termination Trigger	Measurement Mechanism
6.	ANPR Accuracy of ANPR cameras	10 points if $\geq 95\%$ 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, NWPPL/NEPPL can conduct random audits on the recorded footages from any ANPR cameras
7.	eChallan 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.
8.	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 NWPPL/NEPPL or Nominated Representative.
9.	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 NWPPL/NEPPL.

Sl#	Performance Area	Scoring	Termination Trigger	Measurement Mechanism
10.	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 $>90\%$ 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 NWPPL/NEPPL.
11.	Variable Messaging System Usage Whether VMS was updated with relevant information when relevant incident was detected in proximity of VMS	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.
12.	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 $>90\%$ and $<95\%$ 0 points for $<90\%$	If 0 points in any two quarters in a 12 month period.	

9.1.4 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 CLIENT ERP or NHAI ERP/MIS System	API or Upload based sharing of reports from ATMS software to 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.
Remote Video Check NWPPL/NEPPL 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 NWPPL/NEPPL. If SI has not uploaded/registered camera details on ATMS Module on Client ERP or 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

9.1.5 **Note:** Any downtime for maintenance should be within the SLA periods and with written intimation to NWPPL/NEPPL. Only in special circumstances and in written consideration of the PD that the downtime may extend SLA period.

9.1.6 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.

9.1.7 **Non Compliance to Safety Standards at Site**

Failure by the System Integrator's personnel in maintaining the safety standards at the site at any time shall attract penalty on every instance noticed by NWPPL/NEPPL.

- 9.1.7.1 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.
- 9.1.7.2 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 NWPPL/NEPPL (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. NWPPL/NEPPL 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.

9.1.8 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 shall attract penalty @ INR 5000/- (Rupees Five Thousand) per day per Personnel. In case the delay is more than 3 weeks, NWPPL/NEPPL 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 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.

9.1.9 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, NWPPL/NEPPL may consider termination of the contract and forfeiture of performance bank guarantee.

9.1.10 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 relevant Govt act.

9.1.11 Penalties Imposed by Authorities:

9.1.11.1 The System Integrator shall be solely responsible for all penalties, fines, or other financial liabilities imposed by the National Highways Authority of India (NHAI), or any other statutory, regulatory, or administrative authority having jurisdiction over the ATMS systems, arising from following but not limited to:

- 1.** Non-compliance with applicable laws, regulations, or standards.
- 2.** Failure to meet performance requirements or service level agreements.
- 3.** Deficiencies in the design, installation, operation, or maintenance of the ATMS systems.
- 4.** Any other act or omission on the part of the System Integrator, its employees, subcontractors, or agents.

9.1.11.2 The Client shall promptly notify the System Integrator of any such penalty imposed. The System Integrator shall be required to pay the penalty within the timeframe specified by the relevant authority.

9.1.11.3 The System Integrator shall indemnify and hold harmless the Client from any and all claims, losses, damages, or expenses arising from such penalties.

9.1.12 **Liquidated Damages (LD)**

9.1.12.1 Failure of the service provider to install and commission the ATMS system within the timelines specified in the RFP shall attract liquidated **damages @ 0.1 %** of the total contract value for each week of delay in implementation. The total levied penalty, however, **shall not exceed 10% of contract value**.

9.1.12.2 Once the liquidated damages reach maximum limit, NWPPL/NEPPL may terminate the contract and encash the performance bank guarantee.

9.1.12.3 Upon termination of the Agreement due to service defaults, NWPPL/NEPPL may choose to allocate the said site to any other Service Provider, at its sole discretion and at the risk and cost of the defaulting Service Provider.

9.1.12.4 In case NWPPL/NEPPL is of the view that the delay is due to reasons beyond the control of the Service Provider, a suitable extension of time may be granted to the Service Provider with or without imposing any Damages on such Service Provider in the absolute discretion of NWPPL/NEPPL.

9.1.12.5 Damages shall be payable by the Service Provider within 5 days of imposition thereof by NWPPL/NEPPL, failing which the same shall be deducted from the payments to be made to the Service Provider or from the Performance Security as deemed appropriate by NWPPL/NEPPL.

9.1.12.6 The Damages payable, as set forth in this Contract, 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").

9.1.12.7 Notwithstanding any provisions regarding liquidated damages for delivery delays within this RFP, relaxation in Liquidated Damages (LD) pertaining solely to delays in the delivery of Camera systems arising directly from intermediate ER-BIS certification processes required may be considered. However, the final timeline for the commissioning of the project shall be required to be met by

the bidder, failing which applicable penalty clause(s) shall be imposed. The Bidder shall provide documented evidence demonstrating that the delivery delay is directly attributable to such certification processes. This exclusion may apply only to the portion of the delay demonstrably caused by these intermediate certifications. Any other reason affecting the project schedule shall not be accepted.

9.2 Spare Parts

The purpose of **spare parts** and **tools** for the maintenance of an Advanced Traffic Management System (ATMS) is to ensure the system operates continuously and meets the Service Level Agreement (SLA) requirements. Both spare parts and tools are essential components in fulfilling SLA commitments, as they directly impact the system's performance, uptime, and reliability. Both **spare parts** and **tools** are essential for ensuring that the ATMS is effectively maintained and that the system remains operational, minimizing downtime and preventing violations of SLA terms.

Spare parts provide quick replacements for failed components, while tools are necessary for diagnostics, repairs, and preventive maintenance. Together, they help ensure the smooth operation of the ATMS, meeting SLA expectations for uptime, response time, and overall system performance.

9.2.1 Minimize System Downtime:

Spare parts enable quick replacements of failed or damaged components (e.g., traffic sensors, cameras, controllers, communication equipment, etc.), reducing downtime and ensuring that the ATMS continues functioning without significant interruptions.

9.2.2 Ensure System Reliability:

Spare parts ensure that the system remains functional by replacing faulty or worn-out components. This helps maintain the reliability of critical components such as traffic signals, sensors, and control units, ensuring the ATMS can manage traffic flow effectively.

9.2.3 Compliance with SLA:

SLAs often specify response times for repairs and maximum allowable downtime. Spare parts are essential to meet these criteria by allowing swift repairs, reducing the time it takes to restore the system to full operation, and preventing breaches of SLA terms.

9.2.4 **Preventive Maintenance:**

Having spare parts readily available allows for proactive maintenance, replacing components that are nearing the end of their life cycle before they fail. This helps prevent unplanned failures that could lead to SLA violations.

9.2.5 **Cost-Effective Maintenance:**

By keeping spare parts on hand, maintenance teams can avoid delays caused by ordering parts and waiting for delivery. This results in quicker repairs and potentially lower operational costs.

9.2.6 **Ensure Safety and Traffic Flow:**

The ATMS ensures safe and efficient traffic flow. Spare parts are vital to maintain equipment like traffic signal controllers, variable message signs, and surveillance cameras, all of which are critical for managing traffic and ensuring road safety.

9.2.7 **Tools:**

9.2.7.1 **Efficient Repairs and Replacements:**

Tools are necessary for performing maintenance tasks like the installation, calibration, or repair of ATMS components. Proper tools enable technicians to carry out repairs efficiently and accurately, ensuring minimal disruption to the system.

9.2.7.2 **Ensure Compliance with Maintenance Protocols:**

Many maintenance tasks require specialized tools (e.g., for recalibrating sensors, diagnosing faults, or adjusting signal controllers). Having the right tools ensures that these tasks are done according to manufacturer guidelines and industry standards, helping to ensure the system operates as intended and meets SLA expectations.

9.2.7.3 Reducing Repair Time:

Tools such as diagnostic equipment, testing devices, and specialized instruments help technicians quickly identify and address problems. The faster issues can be identified and fixed, the more likely it is that the SLA uptime requirements will be met.

9.2.7.4 Troubleshooting and Diagnostics:

Tools such as multimeters, computer, laptop, oscilloscopes, and software-based diagnostic tools help maintenance teams quickly diagnose issues with system components. The ability to quickly pinpoint and fix problems ensures that the ATMS stays operational and avoids violating SLA terms related to response and resolution times.

9.2.7.5 Preventive Maintenance and Calibration:

Many ATMS components require periodic calibration and maintenance to function correctly (e.g., ensuring traffic sensors are accurately reading vehicle counts). Specialized tools help ensure these activities are carried out properly, preventing failures that might lead to SLA non-compliance.

9.2.7.6 Safety and Compliance:

Proper tools also ensure that technicians can safely perform repairs or maintenance without risking injury or damaging the equipment. This is particularly important when working with electrical systems, elevated equipment (e.g., cameras or signal poles), or heavy machinery.

10 OPERATION AND MAINTENANCE (O&M)

10.1 O&M Requirements for ATMS

- 10.1.1 The Contractor deployed for the implementation of Operation and Maintenance of ATMS shall be retained for the Maintenance for a period of at least 5 years which includes 01 years of defect liability period and 04 years of comprehensive O&M.
- 10.1.2 The System Integrator shall be responsible only for operation and maintenance of the ATMS System, the incident management operation shall be responsibility of client.
- 10.1.3 The purpose of the ITS maintenance work is to keep the ATMS system and related facilities operating as originally intended, that is, to efficiently monitor incidents on the highway and provide essential services and assistance to commuters. The 24/7 operation of ATMS will play a crucial role in providing these services and maintaining all components of the system, including field equipment and command control center equipment, in a timely manner. Maintenance of the equipment and system shall be done promptly.
- 10.1.4 The Manpower proposed here shall be dedicated for this project and shall not be proposed for any other project or assigned any other project. The resource cannot change for at least two years. The substitute proposed by the Contractor must be equivalent or more experienced than the proposed candidate in all respect (no. of years of relevant experience, no. of similar projects executed, qualification of the replacement candidate, etc.).
- 10.1.5 The scope of the Operation & Maintenance Contractor shall include, but not be limited to, the following works:
- I. On-site manpower support for the ATMS system operations & Maintenance (ATMS Maintenance).
 - II. Safety measures.

- III. Any other miscellaneous items required for the operations and upkeep of the system.
- IV. Adherence to the Service Level Agreement (SLA) parameters.
- V. Periodic, preventive and breakdown of the ATMS equipment & maintenance of vehicles.
- VI. Tools, tackles for equipment maintenance and upkeep of the spars and Systems.

10.2 Manpower detail & responsibility

The Minimum manpower for the maintenance along with their relevant qualification shall be as per the below table:

Sl#	Role / Position	No of Personnel	Minimum Qualifications	
			Educational	Work Experience
1	Maintenance Manager	1 Nos	Engineering Graduate in Electronics / IT/ Computer Science or similar	Minimum 5 years in maintenance management of similar systems
2	Maintenance Engineers	9 Nos (3 per shift)	Diploma in Electronics / IT or similar trade	Minimum 3-year experience in maintaining similar systems.
3	Database / IT admin	3 Nos (1 per shift)	MCA or Graduate in Engineering	Minimum 6-year experience in maintaining Similar systems, Databases, IT setups (hardware and software)

10.2.1 Dedicated Vehicle should be deployed 24x7 for attending maintenance requirement of ATMS.

10.2.2 An 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.

10.3 Maintenance

10.3.1 Maintenance Functions

The Maintenance function consists of the following activities:

- 10.3.1.1* 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.
- 10.3.1.2* 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.
- 10.3.1.3* Software Upgrades – This involves the implementation of new versions of software released time to time by the system integrator.
- 10.3.1.4* Verify System Calibration – Calibration will be performed periodically and / or as per manufacturer's requirements on each relevant equipment.
- 10.3.1.5* Software Support Service & Network Solution Service – This involves Data management, Software And Network Solution Support Services;
- 10.3.1.6* Technical Support – This activity is to provide engineering and technical support as and when required;
- 10.3.1.7* 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.

10.3.2 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:

10.3.2.1 Checking the condition of components, e.g. check connections for signs of deterioration.

10.3.2.2 Preparation of planned yearly/ monthly routine maintenance schedule.

10.3.2.3 Perform the maintenance works as per agreed schedule. Any Changes to the schedule shall be notified to NWPPL/NEPPL by submitting the Change Routine Maintenance Schedule.

10.3.2.4 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.

10.3.2.5 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.

10.3.2.6 Voltage level changes are caused by the deterioration of capacitors, transformers and semiconductor components.

10.3.2.7 Certain measurements can also be performed to check the status of elements of the system, i.e. Impedance and isolation tests.

10.3.2.8 Mechanical components need routine cleaning and lubrication to ensure their effective operation.

10.3.2.9 Preparation and submission of monthly performance report.

1. Summary of rectification of notified problems.
2. Maintenance schedule and actual date of maintenance works.
3. Records of communication on the occurrence of delay of routine maintenance and rectification works.

10.3.2.10 Rapid rectification of defects found during routine maintenance.

10.3.2.11 Necessary safety procedures / guidelines shall be followed during routine maintenance.

10.3.3 **Data Management and Software Support Services (including software housekeeping)**

This essentially includes

- I. 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.
- II. Immediate rectification of any problem and data recovery
- III. 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.

10.3.4 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.

10.3.5 Roles of Members of the Maintenance Team

10.3.5.1 Maintenance engineers

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.

10.3.5.2 IT / Database Administrator

The Database administrator is responsible for data management and software support services taking the support of maintenance engineers wherever required.

10.3.5.3 Maintenance Manager

The maintenance manager is responsible for meeting the maintenance service level requirements. Her / His role specifically includes

- I. 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.
- II. Improving maintenance procedures (including the spares holding policy) based on the above analysis
- III. Planning and implementing training programs for the team based on the above analysis.
- IV. Interacting with stakeholders along with the Operations team in evolving better maintenance practices, optimal maintenance schedules and contribute towards improvements in operations.

11 ATMS TRAINING

11.1 General

A training program shall be provided to operation and maintenance team by System Integrator before starting the operation period.

System Integrator shall organize training seminar before the technology transfer. After Seminar, the technologies, required knowledge and skills should be explained to the Employer/ Employer's representative & O&M contractor's O&M staff.

On-the-Job Training to be provided on mitigation measure planning, supervision, monitoring and reporting of activities to Employer/ Employer's representative & O&M contractor's, and O & M staff. Training to be conducted post the system integration; System Integrator shall train Employer/ Employer's representative & O&M contractors to operate the equipment installed and to conduct any routine diagnostics and routine maintenance work. The System Integrator shall provide training courses for at least:

Decision Makers/ Management

1. Employer's operations personnel
2. Users of Various Systems/Applications developed as part of the Project
3. Employer/ Employer's representative & O&M contractor's

Contractors shall provide all training materials in both Microsoft Office and Adobe PDF formats, consisting of graphics, video and animations. The training and training material shall be made available in Hindi, English and local language as per the requirement.

The training program as specified herein shall be provided for the management and operation team. The subjects and contents of the training shall focus on the operation of the equipment and system. The training on the administrative procedure will be provided separately. All trainings shall be conducted in each project location specified by the Client.

The Contractor shall develop all materials required for training and furnish four (04) copies of each manual, class note, visual aid, and other instructional materials to the Employer/Engineer for distribution to the attendants. The manuals, instructions, and training notes shall be in loose-leaf binder form for each projects.

The outline of the lectures or demonstrations and a sample or description of all training aids shall be submitted to the Client representative & O&M contractor's for review at least thirty (30) days prior to their proposed presentation or use. Written approval from the Employer of these materials shall be required prior to the scheduling of training sessions and/or the production in quantity of any training materials

The minimum content and duration (contact hours) of classroom training sessions shall be as specified herein, plus such other topics as are necessary, to ensure effective training. Notwithstanding the contact hours specified herein, all training shall be effective and shall be completed by the Contractor to the satisfaction of the Employer/ Employer's representative & O&M contractor.

The Contractor shall provide training to designated staff members of the Employer/Engineer in the use and maintenance of the items, features and systems of the ATMS system, such that the trained personnel shall become fully conversant with the contents of the equipment, its operation and equipment manuals.

The training shall be in-depth series of sessions, which shall comprise of both classroom type training as well as practical training. The training shall be specific for both classes of personnel, being Operational and Maintenance personnel. A detailed training program and schedule shall be submitted to the Employer/Engineer by the Contractor in advance of the actual training conducted after the approval of the Client or employer.

11.2 Management and Operations Training

The management and operations training shall include classroom instructions, on-site demonstrations, and follow-up reviews. The training shall be designed for Employer/ Employer's representative & O&M contractor's and shall cover all

ATMS operation procedures site, control centre and back-office processing of the ATMS system.

The initial classroom instructions and on-site demonstrations shall be completed after the implementation of the system but before starting of the trail run. The contents of this training shall include as a minimum the following:

11.2.1.1 System Management

- I. System overview
- II. System operation
- III. Operations overview
- IV. Data requests and data displays
- V. Reports
- VI. Functions and duties of ATMS control center and Traffic personnel.
- VII. ATMS field equipment & Control center equipment System.
- VIII. Normal start-up and shut-down procedure
- IX. TMCS, VIDES, VASD, VMS, Control Center and other related process.
- X. Interpretation and response to alarms and fault messages
- XI. Server, workstation and peripheral equipment operations
- XII. Interpretation of monitor displays and print-out reports
- XIII. Use of diagnostic programs and procedures
- XIV. Interpretation and response to alarms and fault messages
- XV. Operation of CCTV surveillance system equipment.
- XVI. Data input, data requests, data displays and data backup
- XVII. Data gathering and operation monitoring & Management of Highways incident through ATMS system.

11.3 Maintenance Training

The Contractor shall provide maintenance training to the Employer/Engineer staff or to the staff designated by the Employer during the trial operation using maintenance manuals provided under the contract. The training shall consist of system maintenance, software maintenance, and hardware maintenance.

11.3.1 System Maintenance Training

The system maintenance training shall include but not be limited to the following:

- 11.3.1.1 Modification of system parameters and version control.
- 11.3.1.2 System backup and restoration
- 11.3.1.3 Switchover between prime and backup servers
- 11.3.1.4 Use of diagnosis program
- 11.3.1.5 Diagnostics process of failed equipment, replacement process & testing and live

11.4 Software Training

The software maintenance training shall include but not be limited to the following:

- 11.4.1 Software configuration
- 11.4.2 Version- up of the operating system and other software provided by the third party
- 11.4.3 Updating of software .
- 11.4.4 Software backup and restoration
- 11.4.5 Database backup and restoration
- 11.4.6 Use of diagnosis programs

11.5 Hardware Training

The hardware maintenance training will be provided for all equipment included under the contract and shall include, but not be limited to, the following:

- 11.5.1 Routine check-up, adjustment and cleaning
- 11.5.2 Diagnosis of all equipment
- 11.5.3 Identification of defective unit

11.5.4 Disassembly and assembly procedure

11.5.5 Replacement of unit and parts

11.5.6 Test procedure and threshold

11.5.7 Use of measuring apparatus

12 INFORMATION SECURITY & SAFETY

12.1 Information Security and Data Protection

- 12.1.1 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. 313 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.
- 12.1.2 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.
- 12.1.3 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.
- 12.1.4 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 Authority/client from time to time.

12.2 Equipment Security

- 12.2.1 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.
- 12.2.2 The contractor/concessionaire may use adequate manual safety measures or implement suitable electronic security mechanisms for same.

- 12.2.3 All the systems, sub-systems and equipments should be adequately insured to offset loss due to vandalism/theft etc.

12.3 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.

12.4 Work Area Safety and Traffic Control

12.4.1 General

- 12.4.1.1 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.
- 12.4.1.2 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.
- 12.4.1.3 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.
- 12.4.1.4 Compensation for meeting the requirements of this section shall be included in the various bid items and no separate payments will be made, therefore.
- 12.4.1.5 Penalties shall be applicable as prescribed in the Penalty clause above, in case of any non-compliance or safety violation.

12.4.2 Highway Lane Closure

No lane closure shall be permitted on any road during peak hours except with prior approval of the CLIENT. 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 CLIENT. Notwithstanding the provisions above, the CLIENT and the police shall have the power to order the lane closure removed or to require better traffic control measures.

12.4.3 Warning Signs

12.4.3.1 All work area warning signs shall conform to the requirements in the relevant regulations in India.

12.4.3.2 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.

12.4.3.3 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.

12.4.3.4 The design, specifications, quantity, location, placement of the Signages shall fully comply with IRC 67 2022, and/ or applicable international code.

12.4.4 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.

12.4.5 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.

12.5 NWPPL/NEPPL Standard Operating Procedure “Safety Measures for Working on Live Road”

The Contractor Must comply with the NWPPL/NEPPL Standard Operating Procedures for working on live road, as mentioned herein during the implementation and O&M period.

12.5.1 INTRODUCTION

The Standard Operating Procedure (“SOP”) shall form minimum standards to be achieved to mitigate the risk/ impact involved in the road diversion and O&M operations across all project sites.

12.5.2 SCOPE

This SOP - ‘Safety Measures for Working on Live Road’ is applicable to National Highways Infra Trust (“NHIT”) applicable entity (ies) means the legal entity (ies), under the Trust, which holds the Concession (s) granted by the Authority and includes all such asset (s) forming part of the Concession.

12.5.3 APPLICABILITY

The SOP is applicable for all the activities to be performed on live road including service road. i.e. – Routine maintenance, Initial Improvement work and any other non-routine activity on live road.

12.5.4 PURPOSE

The purpose of the SOP is to minimize the hazards and risks in traffic diversion and smoothness of traffic on the National Highways in O&M and improvement works.

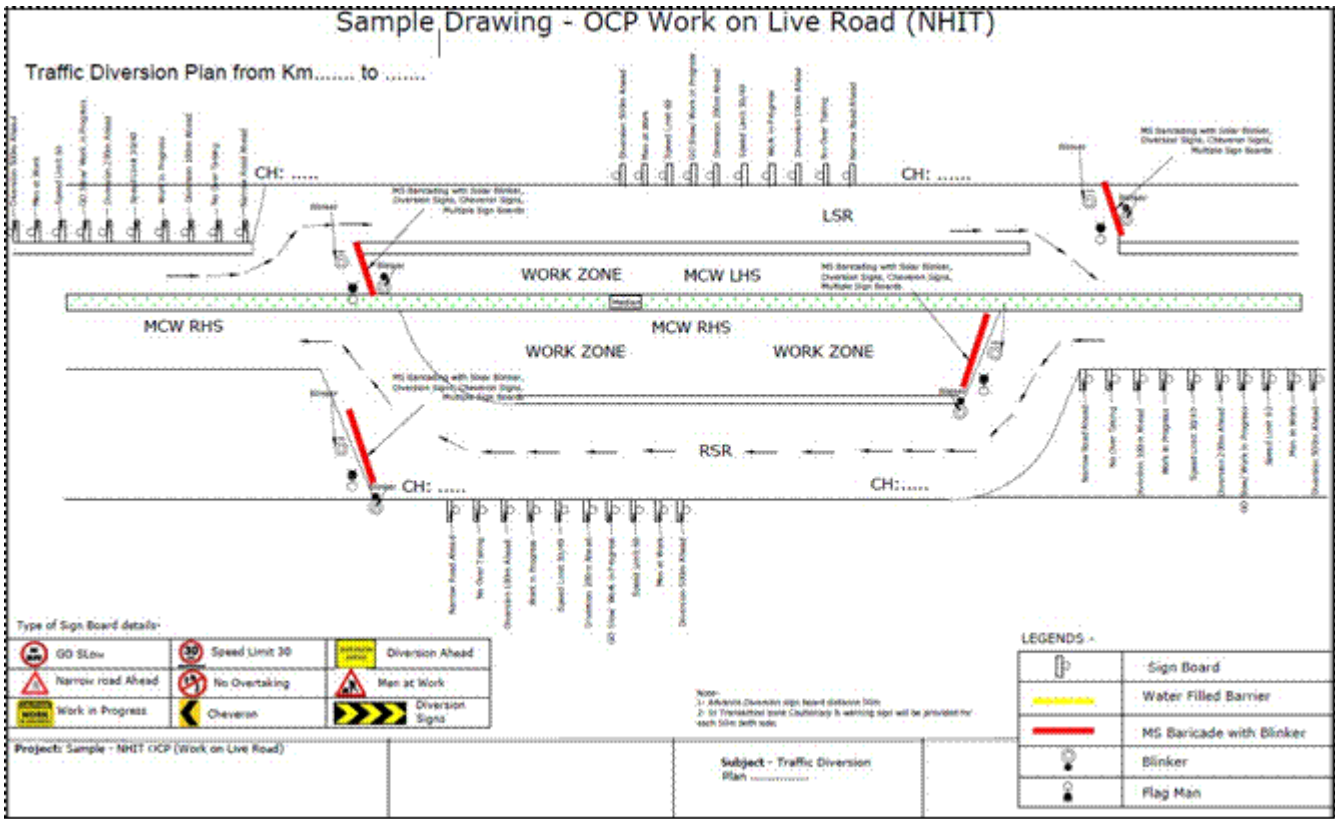
12.5.5 REFERENCE

- 1.** IRC: SP: 55 –2014- Guidelines on Traffic Management in Work Zones.
- 2.** IRC: 35 – 2015 Code of Practice for Road Markings
- 3.** IRC 67: 2022 Code of Practice for Road Signs
- 4.** IRC: SP: 84-2019- Manual of Specifications and Standards for Four Laning of Highways

- 5. The Building and Other Construction Workers’(Regulation of Employment and conditions of service) Act, 1996
- 6. Motor Vehicle Act,1948

12.5.6 **TRAFFIC DIVERSION PLAN AND PROCESSES:**

Requirement Of Diversion and Barricading for Working on Live Road: Prior to starting the works, a traffic diversion plan confirming IRC SP 35: 1997, IRC SP 55: 2014 and IRC SP 67: 2022 shall be prepared & followed once approved. Sketch of a diversion plan as sample given below.



12.5.6.1 Before Start of Work or during execution:

The respective contractor is responsible for preparing the Traffic Management Plan (TMP). The Maintenance Team (Manager/Engineer – NHIT) is responsible for ensuring that the TMP is prepared and implemented as specified in the guidelines, with all sign boards and barricades.

- a) The plan must be approved by the respective authority or independent engineer, as applicable. In case of non-compliances, the plan must be revised and resubmitted for approval.
- b) Once approval is received, the plan must be implemented on the ground, and work can then be started accordingly.
- c) During Execution, the traffic management arrangements must be checked on the ground as per the IRC SP 35: 2015, IRC SP 55: 2014, and IRC SP 67: 2022.

12.5.6.2 Partially Completed Section:

- a) In the case of staged construction scenario, partially completed sections are opened for traffic operations. Ensure the TMPs must be prepared before opening the section for traffic to indicate temporary markings and temporary signage.
- b) Channelizing safety devices (Rope light, Blinkers) shall be placed for identification of path in the nighttime.

12.5.7 ROAD DIVERSION

12.5.7.1 Diversion extending beyond the shift / days

1. Full Lane closure for Road Work

The following safety guidelines to be followed while providing road diversion:

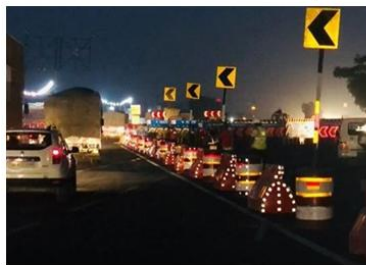
- a) Diversions should be done as per the specifications mentioned in the approved plan.
- b) Diversion pavements should be in good condition with no potholes. Rectify any damaged road or potholes. Ensure the shoulder of the service road is in proper condition to cater to the MCW traffic.
- c) c. Diversion boards should be aligned with no gaps and managed nicely for better presentation.

- d) A minimum of two diversion boards with blinkers and retro-reflective tape should be provided at every exit.
- e) Blinkers must be provided at exit and entry points.
- f) Traffic channelizing devices such as spring delineators and bollards with three rows of reflectors should be provided at merging, demerging, and along the diversion road.
- g) Thermoplastic marking with road studs should be applied along the diversion and transverse bar markings before the diversion point.
- h) All advanced signboards must be installed as per IRC SP 67: 2022.
- i) Provide barricade boards (Type IV), water barricades, and NJ barriers, etc.
- j) Reflective tape, chevron boards, flashlights, rope lights, etc., should be provided to warn commuters during nighttime.
- k) To facilitate easy traffic flow, the time limit for diverting MCW traffic to a service road must be kept to a minimum.
- l) Adequate lighting arrangements should be provided on the service road used as a diversion.
- m) Ensure flagmen (virtual) are provided at both ends of the diversion and at traffic congestion spots in the market.
- n) Entry and exit points must be situated at a 45-degree angle to facilitate lane changes in traffic.

Actual photos of Road Diversions are as below for reference:



Road Diversion in Day Time



Road Diversion in the night

2. Partial Diversion for Road Work:

The following guidelines are to be followed for allowing work on the main carriageway (MCW) for short durations:

- a) The lane should be closed by an MS board 500 meters ahead of the work location.
- b) Blinker or LED chevron lights should be provided.
- c) A red flag and virtual flagman should be displayed.
- d) Traffic cones shall be spaced at 5-meter intervals, with one or two layers of cones* provided in the work zone. The distance between the inner and outer layers of the cones should be 1.2 meters. The outer layer cones should be connected with nylon rope or plastic chain to provide a visible deterrent.
- e) A signboard (Men at Work) should be displayed to caution commuters at a sufficient distance.
- f) All signboards shall comply with IRC SP 67: 2022 regulations and IRC SP 55: 2014.

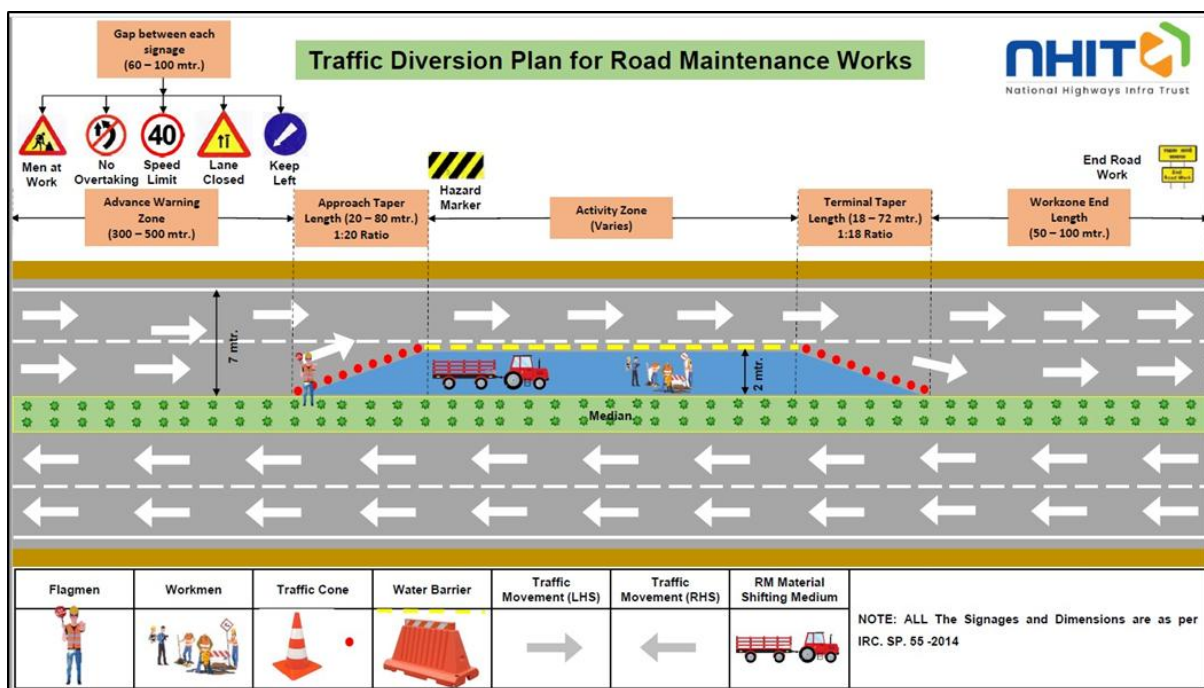
12.5.7.2 Diversion maximum extending up to the day shift - Barricading Requirements for O&M Works:

(RRM & any Non routine activity on Live Road including Service Road)

A robust barricading plan must be maintained to ensure the safety of all site workmen, staff, and commuters. The barricading requirements for O&M works on the MCW must strictly adhere to the specifications outlined in the diagram below. If these requirements are not met, the work must not be started.

1. Construction and Deconstruction of Work Zone

- a) A mechanism shall be put in place to protect workmen on the live carriageway during the construction and deconstruction of the work zone.
- b) Portable VMS boards should be installed in work zones and for traffic diversions at critical locations.
- c) Hazard markings and cautionary blinker boards/reflectors should be installed on all vehicles and tractor trolleys hired through subcontractors



2. The following safety guidelines must be implemented for O&M works:

- Provide an MS board with "Arrow marking & Work in progress" display 100 meters ahead of approach zone.
- Ensure to provide LED chevron or blinker in case of fog or when working during inadequate illumination.
- Display signboards such as "Go Slow" and "Speed Limit" as per the above plan.
- Deploy a flagman with red and green flags and a whistle or place a virtual flagman for better visibility and a risk-free approach.
- Provide safety arrangements as per the above plan. No work shall be allowed until the arrangement is reviewed by the maintenance in-charge/engineer and approved Permit to Work.
- Contractor safety induction must be completed before engaging them in O&M-related work.
- The site manager/engineer must evaluate site hazards and risks before planning any type of O&M-related activities on the live road, along with work zone construction and deconstruction precautionary measures.

- h) Unauthorized access should be closed wherever it is opened or used by surrounding people.
- i) Vehicles should be parked with the carriage body facing towards the entrance of the vehicle.
- j) Work shall be executed only when there is dedicated supervision.
- k) Contractors should ensure sufficient manpower to provide safety arrangements on the live carriageway.
- l) In case of road curvature, an MS board with "Men at Work" and arrow markings should be placed on the live carriageway in the lane 500 meters ahead of the working place.
- m) For any work at height, ladders and full-body harnesses should be used by the workmen.
- n) No one should cross the road while talking on the phone and accompanied by supervisor.
- o) Ensure all workers and employees are wearing PPEs at the workplace.
- p) No one should take a rest or sleep in the vicinity of any vehicle at the site.
- q) Contractors should be engaged at the site based on their acceptance of the above safety arrangements as per IRC & NHIT SOP requirements.

12.5.8 **TRAINING & AWARENESS:**

Training & Awareness must be conducted to all front-line supervisors & workers for making safe diversions as per approved specifications. It must be included in regular TBTs.

12.5.9 **RECORDS:**

Hard copy (Duly filled & signed by maintenance team) of surrendered permit, checklist and other forms & format to be retained & maintained by EHS site EHS department. (Retention period – 4 Months.)

12.5.10 **NOTE:**

- a. Tractor-driven water tankers shall not be used for watering median plants or for any other purpose.*
- b. Old-generation Hydra cranes shall not be used or engaged for any lifting operations, including incident management works.*

- c. Under no circumstances shall manpower be lifted inside a makeshift man basket.*
- d. Manpower shall not be transported in a tractor trolley or any other transporting vehicle. The use of passenger vehicles must be ensured at all times.*

13 TIMELINES AND PAYMENT MILESTONE

13.1 Timelines for ATMS System

(Total **8 months** for implementation, 1 Year or DLP and 4 years of O&M)

Sl #	Activities	Timelines
1.	Letter of Award	T
2.	Signing the Contract Agreement	T + 15 days
3.	Submission of System Design Report	T + 30 Days
4.	Approval of System Design Report	T + 1.5 Months
5.	Completion of FAT for all mentioned items	T + 2 months
6.	Completion of Material Delivery at site	T + 5 months
7.	Completion of ATMS equipment installation and Installation Acceptance Test (IAT)	T + 7 months
8.	Commissioning and Go Live	T+7.5 Months
9.	System Acceptance test (SAT)	Within 15 days of Go-Live
10.	Defect Liability Period	12 Months from the date of SAT
11.	Operation and Maintenance	48 months beyond completion of DLP.

13.2 Payment Milestone

13.2.1 Payment Milestone for CAPEX Value

Milestone #	Milestone Head	Amount	Supporting documents and Remarks
Milestone-I	Mobilization Advance	10% of Capex value	Payment to be released against receipt of invoice and an irrevocable Advance Bank Guarantee (ABG) for 100% of claimed payment made out in favor of NWPPL/NEPPL. The ABG shall be released after successful completion of Milestone III.
Milestone-II	Approval of System Design Report and Completion of Factory Acceptance Testing (FAT) for all listed equipment in RFP.	5% of Capex value	Signed FAT clearance document and Approval on System Design Report to be submitted as supporting along with Invoice.
Milestone-III	Upon delivery of ATMS equipment/system at site location	25% of Capex value	Invoices shall be submitted along with all supporting documents such as

Milestone #	Milestone Head	Amount	Supporting documents and Remarks
			delivery challan, delivery receipts, material verification report signed by site team
Milestone-IV	After Successful Completion of ATMS equipment installation and Conducting Installation Acceptance Test (IAT)	20% of Capex value	Report / Documentary proof for successful installation and signed IAT report to be submitted along with Invoices.
Milestone-V	After successful, commissioning and Go-live of complete ATMS and integration with e-Challan system	20% of Capex value	Report / Documentary proof for successful Commissioning and Go-Live to be submitted along with Invoices.
Milestone-VI	On successful acceptance of System Acceptance Test for ATMS (including closure of all punch-points)	20% of Capex value	SAT clearance report to be submitted along with Invoices

13.2.2 Payment OPEX (Operation & Maintenance Phase)

Milestone #	Milestone Head	Amount	Supporting documents and Remarks
Milestone-VI	Operations & Maintenance phase	1st year – 10% of O&M price to be released in equal quarterly installments 2nd Year – 15% of O&M price to be released in equal quarterly installments 3rd Year – 20% of O&M price to be released in equal quarterly installments 4th Year – 25% of O&M price to be released in equal quarterly installments 5th Year – 30% of O&M price to be released in equal quarterly installments	O&M payment for the site shall start w.e.f. of date of system acceptance of the site by NWPPL/NEPPL. Invoices shall be submitted post completion of a quarter only, along with all supporting documents for SLA adherence.

13.2.3 Submission of Invoices:

- 13.2.3.1 All invoices shall be submitted along with supporting documents. Invoices submitted without supporting documents shall NOT be considered for further processing.
- 13.2.3.2 Invoices should be accompanied by a cover letter in the letter head of the company clearly mentioning the Date of Submission, Milestone of Payment, Amount, GST details etc. as per requirements of NWPPL/NEPPL.
- 13.2.3.3 System Integrator should not submit the invoices until all the sub-components/accessories for a particular line item is supplied to the site. System integrator shall write and inform the client or its representative to the inspect/verify the material jointly.
- 13.2.3.4 The system integrator shall not submit the invoices more than twice in a calendar month during implementation phase. Any excess number of invoices (more than two occasions/instances) shall not be accepted.
- 13.2.3.5 The Invoices shall be submitted both in hard copies and soft copies accompanied with a cover letter on the letterhead duly signed by authorized signatory, clearly specifying the payment milestones, GST details etc., along with all supporting documents as specified in the relevant payment terms. Any Invoice which are not accompanied by cover letter and necessary supporting document, shall not be accepted.
- 13.2.3.6 During O&M period, the Contractor shall submit the system generated attendance record of each employee deployed at the locations with each quarterly invoice. The NWPPL/NEPPL shall have the access to the logs of biometric attendance management system for verification of the actual manpower working days in a month. The amount against manpower will be payable only for the duration the O&M personnel will be available at site. In case the required manpower is not available at any location for more than 15 days in a month, no payment shall be made against manpower (as quoted in the financial bid) for that location for whole month, apart from other deductions / penalties as applicable.
- 13.2.3.7 The Manpower deployed shall be dedicated for this project and shall not be proposed for any other project or assigned any other similar project. The resource cannot be change for at least two years. In case of any change in the manpower / person proposed in the bid and manpower / person deployed

upon successful award of the works, minimum 10% remuneration of the proposed role for that particular quarter in which manpower is changed, shall be deducted. The substitute proposed by the Contractor must have more experience than the proposed candidate in all respect (no. of years of relevant experience, no. of similar projects executed, qualification of the replacement candidate, etc.)

13.2.3.8 The payment shall be made in Indian Rupees within 30 days, post verification of the work done vis-a-vis invoice submitted. The Contractor's performance and monthly reports related to the submitted invoice will be evaluated by NWPPL/NEPPL before certifying the same for payment.

13.2.3.9 The quoted prices are inclusive of all Taxes & duties except GST (as applicable on services), which shall be reimbursed separately on production of proof of payment and certificate from Chartered Accountant.

13.2.3.10 NWPPL/NEPPL is not liable to pay any amount (except the amount stated in financial bid) of any nature whatsoever. It is clarified that no amount toward cost or expenses incurred, of whatsoever nature, shall be payable separately for carrying out the services prior to or after the field work such as holding discussion, if any, as considered necessary by NWPPL/NEPPL or otherwise, for any purpose at NWPPL/NEPPL Head office or elsewhere, prior, during and after the conduct of an assignment at site.

13.2.3.11 Contractor shall submit reports to NWPPL/NEPPL as prescribed under Schedule B along with invoices.

13.2.4 **GST Payment Clause:**

13.2.4.1 In case of payment to a GST registered supplier, GST amount as claimed in the invoices by the system integrator/contractor/vendor in terms of provisions mentioned in the Contract Agreement/Purchase Order may be paid along with their invoices subject to:

13.2.4.2 The GST portion that would be released would be proportionate to the amount of work certified as due for payment.

13.2.4.3 If the GST for any previous invoice is not reflected or reflected incorrectly in GSTR-2B after the due date of filing Return under GST Act is over, then for further payments the GST portion will be withheld till the previous GST amount

is reflected accurately in GSTR-2B and position to the extent as depicted above is rectified.

13.2.4.4 However, the GST portion for the final invoice will be withheld till the GST of all invoices including the final invoice are accurately reflected in the GSTR-2B.

13.2.4.5 If a system integrator/contractor/vendor abandons their work before completion, the unpaid GST portion of all invoices raised by them shall be withheld until the GST portion for the said invoices are reflected accurately in GSTR-2B.

14 ATMS IN DISASTER MANAGEMENT

14.1 Introduction

A disaster may be defined as an incident that:

1. Directly affects life and/or health of many people,
2. Adversely affects the environment resulting in an altered environment proving to be detrimental to human wellbeing
3. Damages material assets on a large scale.

Disasters may broadly be of three types:

1. Natural disasters such as floods, earthquakes etc.
2. Human systems failures such as a dam collapse, building collapse and more importantly those related to Chemical, Biological, Radiological and Nuclear (CBRN) emergencies.
3. 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.

14.2 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.

14.3 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.

14.4 Highway management role in 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.

14.4.1 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	Highway status information including Flooding and potential flooding of highway locations, bridges Traffic Status / congestion on various sections of the highway and other highways / roads connecting to it. Estimated Travel times Highway ride quality Adverse weather conditions Alternate roads open / closed status Law & order issues on specific locations	Variable Message Signs NWPPL/NEPPL 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	Road status as above including Estimated travel times Best routes to reach affected areas	Specific CLIENT/NHAI Mobile App Via direct audio communication with the ATMS Control Centre Via visit to the ATMS Control Centre to examine the highway status and discuss plan of action(s).

Services provided by the ATMS for Disaster Management

14.5 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.

- 1.** Satellite telephone at the ATMS Control Centre to communicate with the NDRF and related agencies. This is expected to be provided by NDMA.
- 2.** Establishing a temporary Satellite data link at the ATMS control centre to transfer data on-line to the Client and Master control rooms in case of failure of the existing data link (e.g. MPLS) at the control centre.
- 3.** 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.
- 4.** 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.

15 REPORTING AND INTEGRATION WITH DATA LAKE AND OTHERS.

The Proposed system for ATMS shall integrated with Client ERP or NHAI data lake to report the status of various ATMS systems and Sub-systems. The Integration protocol shall follow the minimum requirements prescribed in below sections:

15.1 Systems Registration

System	Chainage and Direction	Lat/Long	Additional Details #1	Additional Details #2
VIDES/VMS/TMCS/VASD				

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.

15.2 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.

15.3 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.

15.4 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, eChalaan, None etc.

15.5 Vaahan Integration and Challan Report

Incident ID	Incident Type	Datetime of Incident	Automatic/ Manual	Chalaan Forwarded Datetime	Number Plate of Vehicle
				Overview, ANPR, TMCS, Command Centre	

15.6 Emergency Call Report

Number of calls received from 1033 or Local Enforcement Agencies and Action Taken.

Datetime	Caller Location	Call Source (1033, Local etc)	Type of Incident	Time of Dispatch of Vehicle	Time of Reaching of Vehicle	Time for Resolution

15.7 Any Other Integration

The above integration details provided are a baseline for bidder reference. The bidder is fully responsible for integrating the ATMS solution and its subsystems with any third-party solutions as directed by the client. This integration must be completed by the system integrator without incurring any additional costs to the client.

BID SUBMISISON FORMS

Form T-1: Technical Bid Covering Letter

(To be prepared on letterhead of the Bidder & submitted)

To,

Authorized Signatory
NHIT Western Projects Private Limited (NWPPL)
Unit No.: 324, 3rd Floor, D21 – Corporate Park,
Sector-21, Dwarka, Delhi:110077, India.
E mail: procurement@nhit.co.in

Sub.: Request for Proposal (RFP) for Selection of System Integrator for Design, Supply, Installation, Configuration, Integration, Testing, Commissioning and O&M of Advanced Traffic Management System (ATMS) Tender No: NWPPL/ATMS/2024/01 dated 09-04-2025

Dear Sir,

1. I/We, the undersigned, have carefully examined the contents of the 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 confirm that we have reviewed the functional requirements and technical specifications outlined in this RFP. The make and model(s) proposed in our bid fully comply with all RFP functional requirements and technical specifications. We agree that if any deviation or non-compliance with the RFP specifications occurs throughout the contract period, we will replace the equipment/systems with fully compliant solutions at no additional cost to the Client.
4. 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".

5. 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 Security, 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. NWPPL 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 NWPPL shall constitute a binding Contract between us.
2. I/We understand that any terms from this RFP may be included in or modified for the NWPPL's future RFP as needed.
3. 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.
4. I/We declare/**undertake** that:
- a. I/we will execute the work in accordance with the Approach & Methodology defined in application document submitted in response to NWPPL bid, considering the Scope of Work assigned by the NWPPL, fully complying with all specifications, the Service Level Agreement, and the explicit and implied Conditions of Contract of this this RFP.
 - b. I/We possess an operational history of at least five (5) years in the field of ATMS/HTMS as of Bid Due Date, specifically implementation and O&M in this domain. I/We have successfully implemented the ATMS on the following project(s) to confirm the operational history:

Project Name	Current Status	Work Order Date	SAT/Completion Date
<First ATMS/HTMS Project>			

- c. I/We are not under period of blacklisting/debarment/ by NHAI/NHIT/NWPPL or Ministry of Road Transport & Highways, Government of India or any other agency.
 - d. I/We have never been subject to National Company Law Tribunal (NCLT)/Court proceedings for insolvency or bankruptcy.
 - e. I/We have NOT been terminated from any ATMS/HTMS project within the last 5 years from the bid due date by the Ministry of Road Transport & Highways, its executing agencies (IHMCL, NHAI, NHIDCL), or any other Ministry, Public Sector Undertaking (PSU), State or Central Government department, enforcement agency, NHIT, NWPPL, or any autonomous body.
 - f. I/we undertake that none of the key component or its sub-component are procured / sourced from the OEM or its subsidiary from any of the region and / or company barred / banned / blacklisted / having territory dispute / restricted by the any of the Defence Department / any of the Government Department / Authority / PSU / Ministries etc. in India. The bid may be considered as non-compliance / non-responsive in case this requirement is not fully met by the Bidder(s).
 - g. I/We have not 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 RFE, in respect of any tender or request for proposal issued by or any Contract entered into with NWPPL 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.
 - h. I/We, hereby undertake that all documents submitted in support of my bid are genuine, accurate, and presented in good faith, reflecting a true and fair representation of our qualifications and capabilities. I acknowledge that any misrepresentation or falsification may lead to disqualification and further legal action, and I affirm my commitment to upholding the integrity and fairness of this bidding process
5. I/We certify that, I/We have not been convicted by a Court of Law or indicted or adverse orders passed by a regulatory authority within past 5

years from bid due date 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.

- a. 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.
 - b. I / We don't have any conflict of interest in terms of Clause 2.23 in the RFP document. We understand that in case of any direct/indirect conflict found, the bid shall be rejected, and NWPPL may take an appropriate action including blacklisting the firm.
6. I/We offer the cost of the RFP document and Earnest Money Deposit in accordance with the RFP document as per the details furnished below:

	Transaction reference number/BG details	Date	Amount (Rs.)	Issuing Bank/ Branch
1.Tender Fee				
2. Bid Security				

7. The documents in original accompanying the bid document have been submitted in a separate envelope as envisaged in the RFP document and marked appropriately.

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 am submitting 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.

We remain,

Yours sincerely,

Signature and name....

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

Form T-2: Brief Information about the Bidder

(To be prepared on letterhead of the Bidder, scanned & submitted along with bid)

To,

Authorized Signatory
NHIT Western Projects Private Limited (NWPPL)
Unit No.: 324, 3rd Floor, D21 – Corporate Park,
Sector-21, Dwarka, Delhi:110077, India.
E mail: procurement@nhit.co.in

Sub.: Request for Proposal (RFP) for Selection of System Integrator for Design, Supply, Installation, Configuration, Integration, Testing, Commissioning and O&M of Advanced Traffic Management System (ATMS) Tender No: NWPPL/ATMS/2024/01 dated 09-04-2025

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

(f) Name(s) of Directors/ Proprietors/ Partners

.....
.....

- 2) Power of Attorney for this Bid:
- 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 banker³:

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

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

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

Note: The Bidder must provide supporting documents to substantiate the statements in this form including, Copy of Certificate of Incorporation/ Registration, GST Registration Certificate, PAN and any other relevant documents.

³ These details are required for refund of Bid Security.

Form T-3 Bidder’s Average Annual Turnover and Net Worth Certificate

CERTIFICATE (To be given by a Statutory Auditor/CA)

Sub.: Request for Proposal (RFP) for Selection of System Integrator for Design, Supply, Installation, Configuration, Integration, Testing, Commissioning and O&M of Advanced Traffic Management System (ATMS) Tender No: NWPPL/ATMS/2024/01 dated 09-04-2025

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 31.03.2024 (or 2025, as applicable) are as under:

a) Annual Turnover

Amount in Rs.

Financial Year	Amount in figures	Amount in words
FY 2021-22		
FY 2022-23		
FY 2023-24		
FY 2024-25		
Average of 3 years (As applicable)		

b) Net Worth

Amount in Rs.

As on	Amount in figures	Amount in words
31.03.2024		
31.03.2025 (if appl.)		

(Signature of Statutory Auditor/CA)

Name:

Seal:

Place:

For (Name of Accounting Firm)

Name of Partner/Proprietor

Membership Number
Rubber Stamp

Form T-4: Work Experience/Credentials of Bidder

Sub.: Request for Proposal (RFP) for Selection of System Integrator for Design, Supply, Installation, Configuration, Integration, Testing, Commissioning and O&M of Advanced Traffic Management System (ATMS) Tender No: NWPPL/ATMS/2024/01 dated 09-04-2025

Name of Project/Work	<Name of Project or work>	Client Name:	<Client Firm Name>
		Client Address:	<Address of the Client office>
Location of the project	<Address of the Project>	Name of Contact Person:	<Contact person from Client>
		Contact No:	<Contact Details of Client Person>
Contract Value (Excl. of GST)	<Contract/workorder value in INR, excl of GST>	E-mail ID:	<Mail id of Client>
Project Start Date	<Project Inception/start date>	Present Status	<Eg: Completed, Under O&M, Under Implementation>
Completion/SAT Date	<Project Completion/SAT date>	Project Length	Project length in KM
Project Components	<eg: Control Center, TMCS, VIDES, VASD, VMS, OFC, E-challan, ECB etc. >		
Project implications	<details of penalty/LD imposed by the client/authority, if any>		

Name

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

Dated: /...../202..

Note:

- I. Applicant should submit relevant details/proof of each projects.
- II. Please furnish duly filled Form T-4A in support of each relevant project experience claimed
- III. Go-live / acceptance / completion Certificate issued by the customer/client; and
- IV. Work Order / Purchase order / Copy of contract / Letter of Award highlighting detailed scope of project implemented within the last **10 years prior to the Bid due** date as proof for the same.

Form T-4A: Summary of Project Credentials

Sr	Project Name	Client/ Authority	Work Order Date	Completion/ SAT Date	Project Length	Number of Control Center(s)	OFC Length	Number of TMCS/PTZ	Number of VIDES/VIDS	Number of VSIDS/VASD	Number of VMS	Number Of ECB	E-Challan Integration Status	Page No. of Workorder & SAT/Completion

Note: The Evaluation of the bidder shall be done based on the credentials provided in the form respective to Technical Criteria.

Form T-4B: Current Performance Certificate

To,

<bidder details>

Subject: Current Performance Certificate of ATMS Project implemented at <.....project name.....>

This is to certify that M/s.....<bidder name>..... has completed the implementation of Advanced Traffic Management System at ----- <project name> -----. The project work order issued/contract agreement signed on XX/XX/XXXX. The project implementation was completed on -----<date of SAT/Completion> -----. There was no Penalty/LD imposed on the ATMS contractor/system Integrator during the execution of work.

The project is currently under operation and maintenance (O&M) stage and performance of M/s.....<bidder name>..... is satisfactory up to date of the issuance of this certificate.

Client/Authority Authorized Signatory

Form T-5: Self-Certification on Proprietary ATMS Application

(To be prepared on letterhead of the Bidder, scanned & submitted along with bid)

To,

Authorized Signatory
NHIT Western Projects Private Limited (NWPPL)
Unit No.: 324, 3rd Floor, D21 – Corporate Park,
Sector-21, Dwarka, Delhi:110077, India.
E mail: procurement@nhit.co.in

Sub.: Request for Proposal (RFP) for Selection of System Integrator for Design, Supply, Installation, Configuration, Integration, Testing, Commissioning and O&M of Advanced Traffic Management System (ATMS) Tender No: NWPPL/ATMS/2024/01 dated 09-04-2025

Self-Certification

We, ...[Bidder Company Name]....., hereby undertake and declare that our company owns proprietary ATMS software, which includes integration with all required subsystems as specified in the tender document. Furthermore, this ATMS software has been in continuous operation for a period exceeding three (3) years from the bid due date. We possess full ownership of all Intellectual Property Rights (IPR), source code, and related elements pertaining to this ATMS software.

In support of this undertaking, we are submitting documentary evidence confirming our ownership and the operational history of our ATMS software. We affirm that all information provided in this undertaking and the accompanying documents is true, accurate, and complete to the best of our knowledge and belief.

We hereby submit the following details to confirm the ownership of the ATMS Applications.

1. Proprietary ATMS Integrated Software Details and Project Implementation:

- a) **Software Name:** *[Name of Your Bidder Software Application]*
- b) **Integration with ATMS Sub-Systems** *[eg. TMCS, VIDS, VIDES, VASD, VSDS, VMS, ECB, MRCS etc.]*
- c) **List of Projects Where Implemented:**
 - I. *Project 1: [Project Name], [Location], [Date of Implementation]*
 - II. *Project 2: [Project Name], [Location], [Date of Implementation]*
 - III. *[Continue listing projects as needed]*

2. ATMS Application Overview and Module Screenshots:

a) **Brief Write-up:**

[Provide a concise overview of your ATMS application. Describe its architecture, functionalities, and key benefits along with integration details with ATMS modules]

b) **Module Detail Screenshots:**

- I. **Traffic Management and Control System (TMCS):** *[Insert screenshot(s) of the TMCS module with brief descriptions of the displayed features.]*
- II. **Video Incident Detection System (VIDS) or Video Incident Detection and Enforcement System (VIDES):** *[Insert screenshot(s) of the VIDS/VIDES module with brief descriptions. E.g., "Screenshot of the VIDS interface displaying detected incidents and steps to resolve any incidents."]*
- III. **Vehicle Speed Detection System (VSDS)/ Vehicle Actuated Speed Display (VASD):** *[Insert screenshot(s) of the VSDS/VASD module with brief descriptions. E.g., "Screenshot showing vehicle speed monitoring and violation alerts."]*

- IV. **Variable Message Sign (VMS) Control:** [Insert screenshot(s) of the VMS control module with brief descriptions. E.g., "Screenshot of the interface for managing and displaying messages on VMS panels."]
- V. [Include screenshots and descriptions of any other relevant modules.]

Declaration:

We hereby declare that the information provided in this self-certification is true and accurate to the best of our knowledge.

Signature.....

Name

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

Dated: /..../202..

Form T-6 Certification on Number of Employees.

(To be prepared on letterhead of the Bidder, scanned & submitted along with bid)

To,

Authorized Signatory
NHIT Western Projects Private Limited (NWPPL)
Unit No.: 324, 3rd Floor, D21 – Corporate Park,
Sector-21, Dwarka, Delhi:110077, India.
E mail: procurement@nhit.co.in

Sub.: Request for Proposal (RFP) for Selection of System Integrator for Design, Supply, Installation, Configuration, Integration, Testing, Commissioning and O&M of Advanced Traffic Management System (ATMS) Tender No: NWPPL/ATMS/2024/01 dated 09-04-2025

I/We do hereby confirm that <insert number> are on working full-time basis on the pay-roll of the <Name of Applicant> as on application due date.
The details of employees is listed in the below table:

Sr no	Employee Name	Designation	Highest qualification	Date of Joining

*Attach proof of EPFO challan for all employees along with this form (personal details of employees need not be disclosed)

Authorized Signatory
<Applicant name and address>

Form T-7: Affidavit on Litigation / Arbitration History

(on Non-judicial Stamp Paper of Value Rs.100/-)

Name of Bidder:

The Bidder should provide information on any history of litigation or arbitration resulting from the contracts executed for IHMCL/NHAI/NHIT/ MoRT&H/NWPPL in the last five years or currently under execution.

Year	Award for or against Bidders	Name of Client, Cause of Litigation and Matter in Dispute	Disputed Amount (Current Value in India Rs.)	Actual Awarded Amount in India Rs.

INFORMATION REGARDING CURRENT LITIGATION, DEBARRING / EXPELLING OF BIDDER OR ABANDONMENT OF WORK BY BIDDER

1. (a) Has the Bidder or its constituent partners history of litigation awarded against him?

Yes	No
-----	----

(b) If yes, give details

.....
.....

2. (a) Has the Bidder or any of its Constituent Partners or Directors been debarred / expelled, during the last 5 years as on the date of bid, on the basis

of their performance in any assignment or for any other reason including fraudulent and corrupt practices, etc?

Yes	No
-----	----

(b) If yes, give details including period of debarment:

.....

.....

3. (a) Has the Bidder or any of its Constituent Partners or Directors failed to perform on any contract, during the last 5 years as on the date of bid, as evidenced by imposition of a penalty or a judicial pronouncement or arbitration award or has been expelled from any work or contract or have had any contract terminated for breach on their part or abandoned any contract work or has been declared bankrupt?

Yes	No
-----	----

(b) If yes, give details

.....

Note: If any information in this affidavit is found to be incorrect or concealed, prequalification / bid will be summarily rejected. Based on information in this affidavit, NWPPL, in its sole discretion shall take a decision to prequalify the Bidder.

Form T-8: Make and Model List (Unpriced BoM)

To,

Authorized Signatory
NHIT Western Projects Private Limited (NWPPL)
Unit No.: 324, 3rd Floor, D21 – Corporate Park,
Sector-21, Dwarka, Delhi:110077, India.
E mail: procurement@nhit.co.in

Sub.: Request for Proposal (RFP) for Selection of System Integrator for Design, Supply, Installation, Configuration, Integration, Testing, Commissioning and O&M of Advanced Traffic Management System (ATMS) Tender No: NWPPL/ATMS/2024/01 dated 09-04-2025

We hereby confirm that we have diligently examined the RFP ref. "Tender No: NWPPL/ATMS/2025/02 dated 01-07-2025". The make and model detailed in the table below adhere strictly to the prescribed specifications. We further affirm that the proposed make and model will remain unchanged throughout the duration of the contract:

Note: Bidder must fill details in all yellow marked fields.

BoQ Sl#	BoQ Item Name	Make /OEM and Model	Country of Origin	Operating History of OEM	Datasheet Page No
1.1	TMCS (PTZ) Camera	<full name of OEM/ and exact model	<Country of origin or supplier /OEM company.	<Supplier and bidder warranty on the items>	<Page No of bid document where concerned Datasheet is placed>..
Specification for Proposed TMCS (PTZ) Camera					
1	Resolution & FPS				
2	Lense				
3	Image Sensor				
4	Optical Zoom				
5	Digital Zoom				
6	Night Vision IR Illuminator				
7	PAN Degree, PAN Speed, Tilt Degree				
7	Encoding				

8	Housing and IP Rating				
1.6	All requisite Processing Unit and software License for TMCS Video Analytics a) LPU OR Central Server	<full name of OEM/ and exact model	<Country of origin or supplier /OEM company.	<Supplier and bidder warranty on the items>	<Page No of bid document where concerned Datasheet is placed>..
Specification for Proposed LPU or Server					
1	Borad Specifications & details				
2.1	VIDES Fixed Overview Camera	<full name of OEM/ and exact model	<Country of origin or supplier /OEM company.	<Supplier and bidder warranty on the items>	<Page No of bid document where concerned Datasheet is placed>..
Specification for Proposed VIDES Fixed Overview Camera					
1	Resolution & FPS				
2	Image Sensor				
3	Night Vision				
4	Electronic Shutter				
5	Encoding				
2.3	ANPR camera	<full name of OEM/ and exact model	<Country of origin or supplier /OEM company.	<Supplier and bidder warranty on the items>	<Page No of bid document where concerned Datasheet is placed>..
Specification for Proposed ANPR camera					
1	Resolution & FPS				
2	Image Sensor				
3	Electronic Shutter				
4	Housing and IP Rating				
5	Night Vision Capabilities				
2.4	Local Processing Unit (LPU)	<full name of OEM/ and exact model	<Country of origin or supplier /OEM company.	<Supplier and bidder warranty on the items>	<Page No of bid document where concerned Datasheet is placed>..
Specification for Proposed Local Processing Unit (LPU)					
1	a) CPU b) RAM c) GPU				

3.1	4D Radar for Speed Detection One in Each Direction	<full name of OEM/ and exact model	<Country of origin or supplier /OEM company.	<Supplier and bidder warranty on the items>	<Page No of bid document where concerned Datasheet is placed>..
Specification for Proposed 4D Radar for Speed Detection One in Each Direction					
1	Radar Capacity to Monitor the number of Lanes				
2	Operational Range				
3	Tracking Capacity (No. of vehicle Simultaneoulsy)				
4	Speed Detection Accuracy				
3.2	Vehicle Actuated Speed Display (VASD) One display per Lane	<full name of OEM/ and exact model	<Country of origin or supplier /OEM company.	<Supplier and bidder warranty on the items>	<Page No of bid document where concerned Datasheet is placed>..
Specification for Proposed Vehicle Actuated Speed Display (VASD) One display per Lane					
1	Display Panel Type				
2	Multiplexing Ratio				
3	Communication Interface				
4	Display size in MM (Height and Width)				
5	Viewing Angle				
6	Operating Temperature				
3.5	Local Processing Unit (LPU) One Unit for both gantries (LHS+RHS)	<full name of OEM/ and exact model	<Country of origin or supplier /OEM company.	<Supplier and bidder warranty on the items>	<Page No of bid document where concerned Datasheet is placed>..
Specification for Proposed Local Processing Unit (LPU) One Unit for both gantries (LHS+RHS)					
1	Broad Specification of LPU				
4.1	Full Sized Fixed VMS Board, Minimum Length: 5000 mm, Minimum Length: Height : 1800 mm	<full name of OEM/ and exact model	<Country of origin or supplier /OEM company.	<Supplier and bidder warranty on the items>	<Page No of bid document where concerned Datasheet is placed>..

Specification for Proposed Full Sized Fixed VMS Board, Minimum Length: 5000 mm, Minimum Length: Height : 1800 mm					
1	Display Panel				
2	Multiplexing Ratio				
3	Pixel Pitch				
4	Viewing Distance				
5	PCB Material and Thickness				
6	Physical Dimensions (Size) (exlcuding frame)				
7	Operating Temperature				
4.5	Fixed VMS Board on L-Type Gantry Length: 2400 mm, Height : 1800 mm	<full name of OEM/ and exact model	<Country of origin or supplier /OEM company.	<Supplier and bidder warranty on the items>	<Page No of bid document where concerned Datasheet is placed)..
Specification for Proposed Fixed VMS Board on L-Type Gantry Length: 2400 mm, Height : 1800 mm					
1	Display Panel				
2	Multiplexing Ratio				
3	Pixel Pitch				
4	Viewing Distance				
5	PCB Material and Thickness				
6	Physical Dimensions (Size) (exlcuding frame)				
7	Operating Temperature				
4.9	Portable VMS Board Trolley Mounted, Size Dimensions :Length: 1650 mm, Height : 1000 mm .	<full name of OEM/ and exact model	<Country of origin or supplier /OEM company.	<Supplier and bidder warranty on the items>	<Page No of bid document where concerned Datasheet is placed)..
Specification for Proposed Portable VMS Board Trolley Mounted, Size Dimensions :Length: 1650 mm, Height : 1000 mm .					
1	Display Panel				
2	Multiplexing Ratio				
3	Pixel Pitch				
4	Viewing Distance				
5	PCB Material and Thickness				
6	Physical Dimensions (Size) (exlcuding frame)				

Request for Proposal (RFP) for Selection of System Integrator for Design, Supply, Installation, Configuration, Integration, Testing, Commissioning and O&M of Advanced Traffic Management System (ATMS)

7	Operating Temperature				
5.1	24 Core Armoured OFC (Optical Fibre Cable) including 10% additional for the loops & spare	<full name of OEM/ and exact model	<Country of origin or supplier /OEM company.	<Supplier and bidder warranty on the items>	<Page No of bid document where concerned Datasheet is placed>..
Specification for Proposed 24 Core Armoured OFC (Optical Fibre Cable) including 10% additional for the loops & spare					
1	Cable Type				
2	Fiber Count (Cores and tubes)				
3	Chromatic Dispersion				
4	Polarization Mode Dispersion (PMD)				
5	Tube Material				
6	Armour Component				
5.2	40 MM OD HDPE (High-Density Polyethylene) lubricant ducts including 2% extra for spares.	<full name of OEM/ and exact model	<Country of origin or supplier /OEM company.	<Supplier and bidder warranty on the items>	<Page No of bid document where concerned Datasheet is placed>..
Specification for Proposed 40 MM OD HDPE (High-Density Polyethylene) lubricant ducts including 2% extra for spares.					
1	Duct Type				
2	Outer Diameter (OD)				
3	Inner Diameter (ID)				
4	Duct Wall Thickness				
5	Internal Lubrication				
6.1	ATMS Central Processing Server In Hot Standby Configuration (Primary + Secondary) with 21" Monitor, Operating System, Antivirus and Any Other required application/tools.	<full name of OEM/ and exact model	<Country of origin or supplier /OEM company.	<Supplier and bidder warranty on the items>	<Page No of bid document where concerned Datasheet is placed>..
Specification for Proposed ATMS Central Processing Server In Hot Standby Configuration (Primary + Secondary) with 21" Monitor, Operating System, Antivirus and Any Other required application/tools.					
1	Processor				
2	RAM				
3	Drive Bays				
4	Storage				

Request for Proposal (RFP) for Selection of System Integrator for Design, Supply, Installation, Configuration, Integration, Testing, Commissioning and O&M of Advanced Traffic Management System (ATMS)

5	RAID Controller				
6	Display Controller				
7	Operating System				
6.2	Database licensed Edition Latest version of Database as per requirement.	<full name of OEM/ and exact model	<Country of origin or supplier /OEM company.	<Supplier and bidder warranty on the items>	<Page No of bid document where concerned Datasheet is placed>..
6.3	Video Wall 3x3 Dimension 70-inch cubes along with outer Video Wall frame, Video Wall Controller, required Subcomponents & Accessories	<full name of OEM/ and exact model	<Country of origin or supplier /OEM company.	<Supplier and bidder warranty on the items>	<Page No of bid document where concerned Datasheet is placed>..
Specification for Proposed Video Wall 3x3 Dimension 70-inch cubes along with outer Video Wall frame, Video Wall Controller, required Subcomponents & Accessories					
1	Video Wall Matrix				
2	Video Wall Dimensions				
3	Video Wall Cube Size				
4	Video Wall Input Sources				
5	Monitor Bezel Size				
	Video Wall Controller	<full name of OEM/ and exact model	<Country of origin or supplier /OEM company.	<Supplier and bidder warranty on the items>	<Page No of bid document where concerned Datasheet is placed>..
6	Processor				
7	RAM				
8	Resolution				
9	Graphic card(s)				
10	Video Inputs supported				
6.5	Server for hosting third-party COTS Applications (NMS And Integrated Helpdesk) with Operating System, Antivirus and any Other required application	<full name of OEM/ and exact model	<Country of origin or supplier /OEM company.	<Supplier and bidder warranty on the items>	<Page No of bid document where concerned Datasheet is placed>..
Specification for Proposed Server for hosting third-party COTS Applications (NMS And Integrated Helpdesk) with Operating System, Antivirus and any Other required application					
1	Processor				
2	RAM				

Request for Proposal (RFP) for Selection of System Integrator for Design, Supply, Installation, Configuration, Integration, Testing, Commissioning and O&M of Advanced Traffic Management System (ATMS)

3	Drive Bays				
4	Storage Capacity				
5	Operating System				
6.6	Video Recording and Incident Backup Server 180 days Recording Backup Storage, Incident recording storage In Hot Standby mode (Primary + Secondary) with Operating System Licences, Antivirus and any Other required application	<full name of OEM/ and exact model	<Country of origin or supplier /OEM company.	<Supplier and bidder warranty on the items>	<Page No of bid document where concerned Datasheet is placed)..
Specification for Proposed Video Recording and Incident Backup Server 180 days Recording Backup Storage, Incident recording storage In Hot Standby mode (Primary + Secondary) with Operating System Licences, Antivirus and any Other required application					
1	Processor				
2	Operating System Compatibility				
3	RAM				
4	Drive Bays				
5	Storage				
6.7	Video Analytics and Management software (VAMS) for Video Recordings Server to record the feed of all installed cameras on the ATMS project.	<full name of OEM/ and exact model	<Country of origin or supplier /OEM company.	<Supplier and bidder warranty on the items>	<Page No of bid document where concerned Datasheet is placed)..
6.8	Network Management System (NMS) Solution Third-party Commercial Off-The-Shelf (COTS) Solution to monitor all network components of ATMS Project.	<full name of OEM/ and exact model	<Country of origin or supplier /OEM company.	<Supplier and bidder warranty on the items>	<Page No of bid document where concerned Datasheet is placed)..
Specification for Proposed Network Management System (NMS) Solution Third-party Commercial Off-The-Shelf (COTS) Solution to monitor all network components of ATMS Project.					
1	License Type				
2	SNMP Integration				
3	User Interface type				
4	Application detail				

6.1	Helpdesk & Inventory Management Solution Third-party Commercial Off-The-Shelf (COTS) Solution integrated with all ATMS Hardware's and Software's.	<full name of OEM/ and exact model	<Country of origin or supplier /OEM company.	<Supplier and bidder warranty on the items>	<Page No of bid document where concerned Datasheet is placed)..
Specification for Proposed Helpdesk & Inventory Management Solution Third-party Commercial Off-The-Shelf (COTS) Solution integrated with all ATMS Hardware's and Software's.					
1	License Type				
2	User Interface type				
3	Integration				
4	Application detail				
6.11	ATMS centralised software with sub-system application integrated with TMCS, VIDES, VASD, VMS, Traffic Management Module, Incident management module, E-Challan system, Audio communication unit, Mobile applications (Rajmarg Yatra, Enforcement Agency App and other similar apps) and other ATMS Subsystems & components.	<full name of OEM/ and exact model	<Country of origin or supplier /OEM company.	<Supplier and bidder warranty on the items>	<Page No of bid document where concerned Datasheet is placed)..
6.14	VoIP based IP Telephone Set for the ATMS Control Centre Building Premise	<full name of OEM/ and exact model	<Country of origin or supplier /OEM company.	<Supplier and bidder warranty on the items>	<Page No of bid document where concerned Datasheet is placed)..
Specification for Proposed VoIP based IP Telephone Set for the ATMS Control Centre Building Premise					
1	Connectivity technologies				
2	Call conference				
3	Display				
4	Headset				
6.15	Network-Attached Storage (NAS) Minimum 32 TB redundant RAID storage	<full name of OEM/ and exact model	<Country of origin or supplier /OEM company.	<Supplier and bidder warranty on the items>	<Page No of bid document where concerned Datasheet is placed)..

Specification for Proposed Network-Attached Storage (NAS)					
Minimum 32 TB redundant RAID storage					
	CPU				
	RAM				
	Number of HDDs Supported				
4	RAID Support				
5	NAS Storage				
6.16	KVM Switch Rack mounted with Minimum 08 Ports	<full name of OEM/ and exact model	<Country of origin or supplier /OEM company.	<Supplier and bidder warranty on the items>	<Page No of bid document where concerned Datasheet is placed)..
Specification for Proposed KVM Switch					
Rack mounted with Minimum 08 Ports					
1	Ports				
2	Connection				
3	Video Resolution				
6.17	Joy Stick for PTZ Camera Network port based Joy Stick, integrated with all PTZ Cameras	<full name of OEM/ and exact model	<Country of origin or supplier /OEM company.	<Supplier and bidder warranty on the items>	<Page No of bid document where concerned Datasheet is placed)..
Specification for Proposed Joy Stick for PTZ Camera					
Network port based Joy Stick, integrated with all PTZ Cameras					
1	Joystick Type				
2	Protocols				
3	Working Temperature				
6.18	Operator Workstation (Multi-Screen) with 21-inch Dual Monitor, Wireless Keyboard, Mouse along with Windows Operating System (Latest available edition), Antivirus and any Other required application	<full name of OEM/ and exact model	<Country of origin or supplier /OEM company.	<Supplier and bidder warranty on the items>	<Page No of bid document where concerned Datasheet is placed)..
Specification for Proposed Operator Workstation (Multi-Screen)					
with 21-inch Dual Monitor, Wireless Keyboard, Mouse along with Windows Operating System (Latest available edition), Antivirus and any Other required application					
1	CPU				
2	RAM				
3	Storage				

4	Video Card and Monitors				
6.21	Fibre Optical Network Switch With 24 SFP port with loaded SFP modules to fulfil all requirements and two RJ 45 Gbe ports	<full name of OEM/ and exact model	<Country of origin or supplier /OEM company.	<Supplier and bidder warranty on the items>	<Page No of bid document where concerned Datasheet is placed)..
Specification for Proposed Fibre Optical Network Switch With 24 SFP port with loaded SFP modules to fulfil all requirements and two RJ 45 Gbe ports					
1	Switch Type				
2	Ports				
3	Environmental Rating				
4	Throughput				
5	Switching Capacity				
6.22	Layer-3 manageable Network Switch with 24 Gbe ports with 4 SFP ports along with loaded module	<full name of OEM/ and exact model	<Country of origin or supplier /OEM company.	<Supplier and bidder warranty on the items>	<Page No of bid document where concerned Datasheet is placed)..
Specification for Proposed Layer-3 manageable Network Switch with 24 Gbe ports with 4 SFP ports along with loaded module					
1	Switch Type				
2	Ports				
3	Environmental Rating				
4	Throughput				
5	Switching Capacity				
6.23	Manageable Network Switch with 8 ports	<full name of OEM/ and exact model	<Country of origin or supplier /OEM company.	<Supplier and bidder warranty on the items>	<Page No of bid document where concerned Datasheet is placed)..
Specification for Proposed Manageable Network Switch with 8 ports					
1	Switch Type				
2	Ports				
3	Environmental Rating				
4	Operating Temperature				
6.24	LaserJet Colour A3 Printer (MFP)	<full name of OEM/ and exact model	<Country of origin or supplier /OEM company.	<Supplier and bidder warranty on the items>	<Page No of bid document where concerned Datasheet is placed)..

Specification for Proposed LaserJet Colour A3 Printer (MFP)					
1	Type				
2	Functions				
3	Duty Cycle				
4	Control Panel				
5	Print Speed (A4)				
6	Print Speed (A3)				
6.25	LaserJet B/W A4 Printer (MFP)	<full name of OEM/ and exact model	<Country of origin or supplier /OEM company.	<Supplier and bidder warranty on the items>	<Page No of bid document where concerned Datasheet is placed)..
Specification for Proposed LaserJet B/W A4 Printer (MFP)					
1	Printing speed				
2	Print resolution				
3	Monthly duty cycle				
6.26	10 KVA UPS in hot standby mode with battery (Lithium-ion) backup of 4 Hours for control room	<full name of OEM/ and exact model	<Country of origin or supplier /OEM company.	<Supplier and bidder warranty on the items>	<Page No of bid document where concerned Datasheet is placed)..
Specification for Proposed 10 KVA UPS in hot standby mode with battery (Lithium-ion) backup of 4 Hours for control room					
1	Rated Power				
2	UPS Technology				
3	Input				
4	Output				
5	Battery				
6.27	75" LED Smart TV for VIDES with mounting accessories & arrangement .	<full name of OEM/ and exact model	<Country of origin or supplier /OEM company.	<Supplier and bidder warranty on the items>	<Page No of bid document where concerned Datasheet is placed)..
Specification for Proposed 75" LED Smart TV for VIDES with mounting accessories & arrangement .					
1	Display Size				
2	TV Type:				
3	Connection				
4	Resolution				

6.28	Firewall along with all required software license (IDS & IPS)	<full name of OEM/ and exact model	<Country of origin or supplier /OEM company.	<Supplier and bidder warranty on the items>	<Page No of bid document where concerned Datasheet is placed>..
Specification for Proposed Firewall along with all required software license (IDS & IPS)					
1	Firewall Throughput				
2	IP Sec VPN Throughput				
3	IPS throughput				
4	Local storage				
5	Advanced Threat Prevention System				
6	Support and License (IDS, IPS)				
7	Number of Ports and Port type				
6.29	50 KVA Servo Stabilizer For Control Room	<full name of OEM/ and exact model	<Country of origin or supplier /OEM company.	<Supplier and bidder warranty on the items>	<Page No of bid document where concerned Datasheet is placed>..
Specification for Proposed 50 KVA Servo Stabilizer For Control Room					
1	Capacity				
2	Input Voltage Range				
3	Output Voltage Range				
4	Correction Speed				
5	Operating Temperature				
6.31	Biometric attendance system with door Access Control System including the Door Lock accessories, all software/hardware solution for minimum 05 doors.	<full name of OEM/ and exact model	<Country of origin or supplier /OEM company.	<Supplier and bidder warranty on the items>	<Page No of bid document where concerned Datasheet is placed>..
Specification for Proposed Biometric attendance system with door Access Control System including the Door Lock accessories, all software/hardware solution for minimum 05 doors.					
1	Biometric System Type				
2	Verification Method				
3	User Capacity				
4	Transaction Capacity				

Request for Proposal (RFP) for Selection of System Integrator for Design, Supply, Installation, Configuration, Integration, Testing, Commissioning and O&M of Advanced Traffic Management System (ATMS)

5	Identification Time				
6.32	Control Room Workstation (Supervision, NMS, VIDES Display , VASD, team E – challan, Govt Authority) with 21-inch Monitor, Wireless Keyboard, mouse along with Microsoft Operating System (Latest Available edition), Microsoft Office (Latest available edition), Antivirus and any Other required application	<full name of OEM/ and exact model	<Country of origin or supplier /OEM company.	<Supplier and bidder warranty on the items>	<Page No of bid document where concerned Datasheet is placed)..
Specification for Proposed Control Room Workstation (Supervision, NMS, VIDES Display , VASD, team E –challan, Govt Authority) with 21-inch Monitor, Wireless Keyboard, mouse along with Microsoft Operating System (Latest Available edition), Microsoft Office (Latest available edition), Antivirus and any Other required application					
1	CPU				
2	RAM				
3	Storage				
4	Display				
5	OS				
6	Mandatory Software				
6.33	NVR 48 channel for the TMC building CCTV cameras along with 60 days recording storage at 25 FPS	<full name of OEM/ and exact model	<Country of origin or supplier /OEM company.	<Supplier and bidder warranty on the items>	<Page No of bid document where concerned Datasheet is placed)..
Specification for Proposed NVR 48 channel for the TMC building CCTV cameras along with 60 days recording storage at 25 FPS					
1	Channels Supported				
2	CPU				
3	Number of HDDs Supported				
4	Storage				
5	RAID Support				
6	Maximum Resolution Supported				
6.34	CCTV Dome Camera for Control Centre building Surveillance	<full name of OEM/ and exact model	<Country of origin or supplier /OEM company.	<Supplier and bidder warranty on the items>	<Page No of bid document where concerned Datasheet is placed)..

Specification for Proposed CCTV Dome Camera for Control Centre building Surveillance					
1	Camera Resolution				
2	FPS (Frames Per Second)				
3	IR Range				
4	Lens				
5	SD Card Slot & Capacity				
6	Microphone				
6.35	CCTV Bullet Camera for Control Centre building Surveillance	<full name of OEM/ and exact model	<Country of origin or supplier /OEM company.	<Supplier and bidder warranty on the items>	<Page No of bid document where concerned Datasheet is placed>..
Specification for Proposed CCTV Bullet Camera for Control Centre building Surveillance					
1	Camera Resolution				
2	FPS (Frames Per Second)				
3	Lens				
4	IR Range				
5	SD Card Slot & Capacity				
6	Microphone				

Name & Signature.....

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

Dated: /...../202..

Note: Bidder should submit the make and models items listed here and attach the relevant documents of each item like technical datasheet, MAF etc.

Form T-9: Manufacturer's Authorization Form (MAF)

[NOTE: The Bidder shall require the Manufacturer to fill in this Form in accordance with the instructions indicated. This letter of authorization should be signed by a person with the proper authority to sign documents that are binding on the Manufacturer. The bidder shall the MAF for at least following components:

1. Video Wall & Controller
 2. Network Switches
 3. Server and Workstations
 4. Local Processing Unit (LPU)
 5. **Cameras:**
 - a. TMCS/PTZ Cameras
 - b. Automatic Number Plate Recognition Camera
 - c. VIDES Camera
 6. Speed Radars
 7. Variable Message Sign (VMS)
 8. Vehicle Actuated Speed Displays
 9. **Software:**
 - a. ATMS Central Software
 - b. Analytics Software for TMCS, VIDES & ANPR
 - c. Software for Audio Communication Unit
 - d. Video Analytics and Management Software (VAMS) for Video Recording Server
 - e. COTS Network monitoring System
 - f. COTS Helpdesk & Inventory Management system
-]**

To,

Authorized Signatory
NHIT Western Projects Private Limited (NWPPL)
Unit No.: 324, 3rd Floor, D21 – Corporate Park,
Sector-21, Dwarka, Delhi:110077, India.
E mail: procurement@nhit.co.in

Sub.: Request for Proposal (RFP) for Selection of System Integrator for Design, Supply, Installation, Configuration, Integration, Testing, Commissioning and O&M of Advanced Traffic Management System (ATMS) Tender No: NWPPL/ATMS/2024/01 dated 09-04-2025

WHEREAS

We [insert complete name of Manufacturer], who are official manufacturers of [insert type of goods manufactured], having factories at [insert full address of Manufacturer's factories], do hereby authorize [insert complete name of Bidder] to submit a Bid the purpose of which is to provide the following goods, manufactured by us [insert name and/or brief description of the goods], and to subsequently negotiate and sign the Contract.

We are Indian [OEM/ Manufacturers / Class-I local supplier/ Class-II local supplier] as per DPIIT Order no. P-45021/2/2017-PP (BE-II) dated 04.06.2020 (revised "Public Procurement (Preference to Make in India) Order 2017").

We have direct presence in India having own service and support offices at [insert full address of Manufacturer's Service Centres] to ensure smooth on-site after sales service support.

We hereby extend our full guarantee and warranty in accordance with RFP requirement, Defect Liability, of the Contract, with respect to the goods offered by the above firm.

We, hereby confirm that the above goods shall be covered under comprehensive on-site warranty for a period of 5 years from the date of installation & commissioning at the site and we shall maintain sufficient spares and have sufficient technical resources at our regional service centre to provide next business day service support at the site. In addition to this, we shall provide adequate training to the on-site maintenance staff of the bidder for regular corrective and preventive maintenance.

We hereby confirm that in case of bidder (above firm) or their employees are not available or barred or terminated from services, we are obliged to provide the same guarantee, warranty or defect liability to NWPPL.

Name: [insert complete name of person signing the Bid]

In the capacity of [insert legal capacity of person signing the bid]

Signed: [insert signature of person whose name and capacity are shown above]

Duly authorized to sign the bid for and on behalf of: [insert complete name of Bidder]

Dated on _____ day of _____, 202_ [insert date of signing]

Quality Certificate from OEM
(To be enclosed with MAF of each Component)

To,

Authorized Signatory
NHIT Western Projects Private Limited (NWPPL)
Unit No.: 324, 3rd Floor, D21 – Corporate Park,
Sector-21, Dwarka, Delhi:110077, India.
E mail: procurement@nhit.co.in

Sub.: Request for Proposal (RFP) for Selection of System Integrator for Design, Supply, Installation, Configuration, Integration, Testing, Commissioning and O&M of Advanced Traffic Management System (ATMS) Tender No: NWPPL/ATMS/2024/01 dated 09-04-2025

We

(Name and address of OEM) certify that everything to be supplied by us hereunder shall be brand new, free from all encumbrances, defects and faults in material. Workmanship and manufacturing shall be of highest grade and quality and consistent with the established and generally accepted standards. Materials of the type ordered shall be in full conformity with the specifications, drawings or samples, if any, and shall operate properly. It is also certified that the supplied items / equipment's have not been sourced from OEM backlisted by Government of India or firms of anti-national antecedents.

We, M/s also undertake that in case of any item supplied by us found to be defective, faulty, or used at any stage, it shall be replaced by us at our cost.

Signature of OEM	Signature of Witness
Name	Name
Seal	Seal

Date

Date

Signature of Bidder

Name

Seal

Date

Form T-10 Proposed Personnel

To,

Authorized Signatory
NHIT Western Projects Private Limited (NWPPL)
Unit No.: 324, 3rd Floor, D21 – Corporate Park,
Sector-21, Dwarka, Delhi:110077, India.
E mail: procurement@nhit.co.in

Sub.: Request for Proposal (RFP) for Selection of System Integrator for Design, Supply, Installation, Configuration, Integration, Testing, Commissioning and O&M of Advanced Traffic Management System (ATMS) Tender No: NWPPL/ATMS/2024/01 dated 09-04-2025

Details of Personnel :

Sl#	Name	Proposed Position	Educational Qualification	Experience (in Years)
1				
2				
3				
4				

Name

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

Dated: /...../202..

NOTE: The personnel details and resume should be provided for the following positions.

Sl#	Role / Position	No of Personnel	Minimum Qualifications	
			Educational	Work Experience
1	Maintenance Manager	1 Nos	Engineering Graduate in Electronics / IT/ Computer Science or similar	Minimum 5 years in maintenance management of similar systems
2	Database / IT admin	3 Nos (1 per shift)	MCA or Graduate in Engineering	Minimum 6-year experience in maintaining Similar systems, Databases, IT setups (hardware and software)

Form T-11 Resume of Key Personnel

[The Bidder shall provide the data on the experience of the personnel indicated in Form T-5, in the form below.]

Name of Bidder

Photo

1. Proposed Position :

2. Name of the Candidate (in Block letters) :

3. Father's/Husband's Name :

4. (a) Date of Birth :

(in dd/mm/yyyy format)

(Please furnish proof of age)

(b) Age as on bid due date :..... Yrs, ... Months &, ... Days

5. Permanent Address :

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6. Address for Correspondence :

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7. E-mail address, Phone Numbers Email:

Mobile:

8. Details of Educational Qualifications from Matriculation onwards

(Please furnish proof of qualifications)

Sl. No.	(1)	(2)	(3)	(4)	(5)
Examination passed	Year of passing	Name of College / Institute	University / Board	Main subjects	Percentage of marks obtained

9. Experience

Total Experience : Yrs, ... Months &, ... Days

Relevant Experience : Yrs, ... Months &, ... Days

10. Details of experience of each employment (in chronological order):

In case of change in posting held within the same employer, please fill in details separately.

1	Name and Address of the organization	Position held	Period of tenure		Responsibilities / Job Profile
			From	To	1
			DD/MM/YYYY	DD/MM/YYYY	2
					3
					4
	Technical details of project experience				

2	Name and Address of the organization	Position held	Period of tenure		Responsibilities / Job Profile
			From	To	1
			DD/MM/YYYY	DD/MM/YYYY	2
					3
			4		
Detailed description of project experience					

3	Name and Address of the organization	Position held	Period of tenure		Responsibilities / Job Profile
			From	To	1
			DD/MM/YYYY	DD/MM/YYYY	2
					3
			4		
Detailed description of project experience					

4	Name and Address of the organization	Position held	Period of tenure		Responsibilities / Job Profile
			From	To	1
			DD/MM/YYYY	DD/MM/YYYY	2
					3
	Detailed description of project experience				

Certification by Candidate:

- i) I am willing to work on the project and I will be available for entire duration of the project assignment and I will not engage myself in any other assignment during the currency of this assignment on the project
- ii) I, the undersigned, certify that to the best of my knowledge and belief, this CV correctly describes myself, my qualification and experience. In case NWPPL discovers anything contrary to above, NWPPL would be at liberty to remove the personnel from the present assignment and debar him for an appropriate period to be decided by NWPPL.
- iii) I, have not left any assignment with the consultants/ agencies/ contractors engaged by NWPPL/ contracting firm for any continuing works of NWPPL without completing my assignment. I will be available for the entire duration of the current project. If I leave this assignment in the middle of the work, I may be debarred for an appropriate period to be decided by NH NWPPL IT. I have also no objection if my services are extended by NWPPL for this work in future.

Signature of the
Candidate

Place:

Date:

Undertaking from Bidder

The undersigned on behalf of (name of bidder) certify that Shri.....(name of the proposed personnel and address) to the best of our knowledge has not left his assignment with any other firm engaged by NWPPL / contracting firm for the ongoing projects and he is currently not engaged with any other firm engaged by NWPPL / contracting firm for the ongoing projects. We understand that if the information about leaving the past assignment with NWPPL without completing his assignment is known to NWPPL, NWPPL would be at liberty to remove the personnel from the present assignment and debar him for an appropriate period to be decided by NWPPL.

Signature of the Authorized
Representative

Place:

Date:

Note:

Each page of the CV shall be signed in ink by both the staff member and the Authorized Representative of the firm. Photocopies will not be considered.

Form T-12 Approach & Methodology

Dated: /...../202..

1. Detailed Methodology:

(Maximum Limit 05 Pages or 2000 Words)

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2. Technical Work Plan:

(Maximum Limit 02 Pages or 1000 Words)

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3. Broad system architecture and design proposed:

(Pictographic Architecture and design details with Maximum Limit of 02 Pages or 1000 Words)

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4. Project Implementation Plan: Equipment Delivery Schedule and Time schedule to complete the entire work under ToR, supported with Bar Chart, including the civil works for TMC:

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5. Limitations on part of bidder to address requirements under ToR and SLA:
(If any)

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6. Design Concept of ATMS Central Processing System (TMC system)

(Design Concept including function and processing for ATMS Central System, Maximum Limit 3 Pages or 3000 words)

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7. Incident/Event Generation Method and Event List

(The Event Generation Method and Event list for design of Central Processing System, Maximum 2 pages or 1000 words.)

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8. Incident/Event Management Method

(The event flow, event priority management method, event associate method, completion of missing data method, tuning of setting, supporting function for event management for Design of Central Processing System.)

Maximum 03 pages or 1500 words.

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9. Exchange Information Method with linked Different Highway Operator

(The method and technology for exchange information and expandable method for exchange information with linking different operator for design of Central Processing System.)

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10. Contents Image of Graphic Display and Dashboard

(Showing Contents Image of important items and Dashboard with feasible technology for effective operation.)

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11. GIS Map layout, process, and features

(Showing GIS Map Image of important items meeting ToR features with feasible technology for effective operation., pictographic and text details with maximum limit of 2 pages or 1000 words)

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12. Operation and Maintenance Service Plan for ATMS

(Method and outline of Operation and Maintenance Service Plan for ATMS, mentioned in the Operation & Maintenance Specification.)

(Maximum Limit 03 Pages or 1500 Words)

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13. On-line Access during the Operations & Maintenance phase

(Access details in 1 page or 500 words)

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14. Equipment and Manpower Safety Plan

(Safety plan details in 2 page or 1000 words)

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15. Spare Parts

List of spare part to meet the SLA.

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16. Proposed Subcontractors for Major Items of Plant Design, Supply and Installation Services

The Details of proposed Manpower for implementation and O&M phase shall be submitted

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17. Arrangements by bidder to address O&M Requirements, including complete manpower details proposed during implementation and O&M period.

(Maintenance plan for ATMS in maximum 3 pages or 1500 words)

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18. Network Layout and Graphical presentation of module and components comprising application of servers and workstation.

Pictographic network layout plan and details in maximum 1 page or 500 words.

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19. Data Security and Data processing flow in the form of class diagram, use case diagram, sequence diagram, or data flow diagram.

(Data Security plan and data transfer flow in 3 pages or 1500 words.)

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20.Scale or size of the module and components, and programming language used.

(Maximum 3 pages or 1500 word).

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Form T-13 Bidder Recommended Spare parts

To,

Authorized Signatory
NHIT Western Projects Private Limited (NWPPL)
Unit No.: 324, 3rd Floor, D21 – Corporate Park,
Sector-21, Dwarka, Delhi:110077, India.
E mail: procurement@nhit.co.in

Sub.: Request for Proposal (RFP) for Selection of System Integrator for Design, Supply, Installation, Configuration, Integration, Testing, Commissioning and O&M of Advanced Traffic Management System (ATMS) Tender No: NWPPL/ATMS/2024/01 dated 09-04-2025

The Following spare items are recommended by the system integrator which shall be maintained throughout the contract period by the **System Integrator on its own cost** (Without any cost implication to the client).

Sr	Item Name	Make /OEM	Model	Country of Origin	End of life	Warranty	Remarks
<Serial no>	<Spare Item Name>	<full name of OEM/ supplier company should be mentioned.	<exact model details of proposed item>	<Country of origin or supplier /OEM company.	<End of life, should not be less than project duration. >	<Supplier and bidder warranty on the items>	<any specific remarks, also please highlight the non-compliance of deviation, if any.

Signature:
Name
Designation/ Title of the Authorized Signatory.....
Dated: /...../202..

Form T-14 Integrity Pact Format

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

RFPNo. Dated.....

This Integrity Pact is made at _____ on this _____ day of _____ 202..

Between

NHIT Western Projects Private Limited (NWPPL) which is having its office at Unit No.: 324, 3rd Floor, D21 - Corporate Park, Sector-21, Dwarka, Delhi:110077, India, hereinafter referred to as **"The Principal"**, which expression shall unless repugnant to the meaning or contract thereof include its successors and permitted assigns.

And

_____, hereinafter referred to as **"The Bidder/Contractor/System Integrator"** 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 for<RFP title>..... 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.

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 RFP documents 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:

- a) No employee of the Principal, personally or through family members, will in connection with the RFP 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.
- b) 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.
- c) 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)

1. The Bidder(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.
2. The Bidder 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.

3. The Bidder 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 of bids or any other actions to restrict competitiveness or to introduce cartelization in the bidding process.
4. The Bidder will not commit any offence under the relevant IPC/ PC Act and other Statutory Acts; further the Bidder 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.
5. The Bidder of foreign origin shall disclose the name and address of the Agents/ representatives in India, if any. Similarly, the Bidder of Indian Nationality shall furnish the name and address of the foreign principle, if any.
6. The Bidder 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.
7. The Bidder will not instigate third persons to commit offences outlined above or be an accessory to such offences.
8. The Bidder 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 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 from the tender process.

1. If the Bidder 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 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 and the amount of the damage. The exclusion will be imposed for a minimum of 1 year.

2. 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".
3. The Bidder 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.
4. 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.
5. 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.
6. 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

1. 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 forfeit

the Earnest Money Deposit / Earnest Money Deposit or demand and recover the damages equivalent to Earnest Money Deposit/ Earnest Money Deposit apart from any other legal right that may have accrued to the Principal.

2. 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.

Article 5 - Previous Transgressions

1. 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.
2. 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/ Subcontractor(s)

The Bidder 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.

1. The Principal will enter into agreements with identical conditions as this one with all Bidder and Subcontractor(s).
2. 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/ 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

1. This Pact begins when both parties have legally signed it. It expires for the Contractor/ Contractor 12 months after his O&M 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.
2. 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 NWPPL.

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.

1. Changes and supplements as well as termination notices need to be made in writing.
2. If the Bidder/ Contractor/ Contractor is a partnership or a consortium, this pact must be signed by all partners or consortium members.
3. 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.
4. 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.

5. 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 done mentioned in the presence of following witnesses:

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

Place:-----
Date: -----

Witness 1:
(Name & Address) -----

Witness 2:
(Name & Address) -----

Form T-15 Power of Attorney

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 Selection of System Integrator for Design, Supply, Installation, Configuration, Integration, Testing, Commissioning and O&M of Advanced Traffic Management System (ATMS)” proposed by NWPPL, including but not limited to signing and submission of all bid(s) and other documents and writings, and providing information/ responses to NWPPL, representing us in all matters before NWPPL, signing and execution of all contracts and undertakings consequent to acceptance of our bid and generally dealing with NWPPL 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, 2018

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.

Form T-16 Bank Guarantee Format

BG No.

Date

To,

Authorized Signatory

NHIT Western Projects Private Limited (NWPPL)

Unit No.: 324, 3rd Floor, D21 – Corporate Park,

Sector-21, Dwarka, Delhi:110077, India.

E mail: procurement@nhit.co.in

1. In consideration of “NHIT Western Project Private Limited (NWPPL) (hereinafter referred to as the “Authority” or “Client”, 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 M/s and having its registered office at (hereinafter referred to as the “Bidder” which expression shall unless it be repugnant to the subject or context thereof, include its/ their successors, administrators, executors and assigns), for submission of bids for the works of (hereinafter called the “Works”) pursuant to **RFP No. dated** of the Authority, and the bidder having agreed to furnish a Bank Guarantee to the Authority as “Bid Security” for the purpose indicated in the said RFP, we, ... (Name of the Bank) having our registered office at and one of its branches at, a body registered / constituted under the (hereinafter referred to as the Bank), which expression shall, unless it be repugnant to the subject or context thereof, include its successors, administrators, executors and assigns at the request of the bidder, do hereby in terms of RFP document, irrevocably, unconditionally and without reservation guarantee the due and faithful fulfilment and compliance of the terms and conditions of 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 aforesaid at any time up to 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 RFP Document.
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 RFP / 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 failure of the Bidder to fulfil and comply with the terms and conditions contained in the RFP/ Bidding Documents including failure of the said Bidder to keep its Bid open during the Bid validity period as set forth in the said RFP / Bidding Document for any reason whatsoever. Any such demand made on the bank shall be conclusive as regards amount due and payable by the Bank under this Guarantee.
 4. This Guarantee shall be irrevocable and shall remain in full force and effect for a period of **180 (One Eighty) days**, followed by a claim period of 60 days. The duration of these periods may be extended by the mutual agreement of the Authority and the Bidder, with the consent of the Bank.
 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 RFP/ 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 RFP / Bidding Documents or to extend time for submission of the Bids or the Bid validity period or the period for conveying acceptance of 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 RFP / 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 RFP/ 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. 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.
14. This bank guarantee shall be valid from
15. Notwithstanding anything contained herein:

- (i) Our liability under this Bank Guarantee shall not exceed Rs./-
- (ii) The Bank Guarantee shall be valid up to.....
- (iii) We are liable to pay the Guarantee amount or any part thereof under this Guarantee only and only if you serve upon us a written claim or demand on or before

Signed and Delivered by Bank.

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

(Signature of the Authorised Signatory)

(Name & Designation with Bank's Official Seal)

NOTE:

- (i) The bank guarantee(s) shall contain the name, designation and code number of the officer(s) signing the guarantee(s);
- (ii) The address, telephone no. 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.
- (iii) The bank guarantee shall be signed by the officials as per the norms prescribed by the RBI in this regard.

Form T-17 Performa for Pre-Bid Queries

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

Sub.: Request for Proposal (RFP) for Selection of System Integrator for Design, Supply, Installation, Configuration, Integration, Testing, Commissioning and O&M of Advanced Traffic Management System (ATMS) Tender No: NWPPL/ATMS/2024/01 dated 09-04-2025

Name of Company: _____,

Authorized Signatory _____

Contact No. _____,

Email Id: _____

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

Form F-1 Format for Financial Bid Submission

(To be filled by bidder in the excel sheet provided along with this bid document and signed copy shall be submitted in a separate financial bid envelope only)

PART-III: Conditions of the Contract

DRAFT CONTRACT AGREEMENT

(To be signed on Stamp Paper)

This Contract Agreement (hereinafter called the "Contract") is made on this _____ day of the month of _____, 202....

BETWEEN

NHIT Western Projects Private Limited (NWPPL) (Or NHIT Eastern Projects Pvt Ltd (NEPPL) having its registered office at 324, D-21, Corporate Park, Sector-21 Dwarka, New Delhi-110077 (hereinafter referred to as the "NWPPL", or "Client" or "Authority" 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 _____ (hereinafter referred to as the "Contractor" or "Service Provider" or "System Integrator" which expression shall unless repugnant to or inconsistent with the context, mean and include its successors and assigns) of the OTHER PART.

WHEREAS

the Contractor, in the ordinary course of its business, is engaged in providing similar services to their clients, and have represented to NWPPL through their bids, against RFP for Implementation of Advanced Traffic Management System, **RFP No. dated** on above subject. (hereinafter called the "Tender") for "Request for Proposal (RFP) for Selection of System Integrator for Design, Supply, Installation, Configuration, Integration, Testing, Commissioning and O&M of Advanced Traffic Management System (ATMS)" that they have the required professional skills, personnel and technical resources to provide the required Services;

- a) on the basis of the said Tender, NWPPL/NEPPL has adjudged the Contractor as a Successful Bidder and issued Letter of Award (LoA) No. dated..... for the same;
- b) 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:

The mutual rights and obligations of the Contractor and NWPPL/NEPPL shall be as set forth in this Contract Agreement, in particular:

The Contractor shall carry out the Services in accordance with the provisions of the Contract; and

- c) NWPPL/NEPPL shall make payments to the Contractor in accordance with the provisions of the Contract.
- d) The following schedules/ appendices shall be deemed to form and be read and construed as part of this Contract Agreement viz.

(a) Schedule A: Conditions of Contract

(b) Schedule B: Terms of Reference

(c) Appendices:

Appendix A Copy of Financial Bid of the Contractor

Appendix B Letter of Award (LOA) issued by NWPPL/NEPPL

Appendix C Letter of Acceptance submitted by the Contractor

Appendix D Copy of the Performance Bank Guarantee 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/ NWPPL
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
(NHIT Western Projects Pvt. Limited)
(Authorized Representative)
Name : _____
Designation _____
Address _____

FOR AND ON BEHALF OF
(M/s _____)
(Authorized Representative)
Name : _____
Designation : _____
M/s _____
Address _____

In the presence of following witnesses:

Name : _____
Designation _____

Name : _____
Designation : _____

Address _____

M/s _____

Address _____

Name : _____

Name : _____

Designation_____

Designation : _____

Address _____

M/s _____

Address _____

SCHEDULE-A : GENERAL CONDITIONS OF CONTRACT (GCC)

1 PURPOSE AND APPLICABILITY OF THE GENERAL CONDITIONS OF CONTRACT (GCC)

1.1 Objective and Enforceability

This General Conditions of Contract (GCC) constitutes the legally binding framework governing the obligations, rights, and liabilities of the Employer and the System Integrator (SI) for the Design, Supply, Installation, Configuration, Integration, Testing, Commissioning, and Operation & Maintenance (O&M) of the Advanced Traffic Management System (ATMS) under this Contract.

This GCC shall have full legal force and effect from the date of execution of the Contract Agreement and shall remain binding throughout the contractual period unless amended in accordance with the provisions stipulated herein.

The terms and conditions set forth in this GCC shall prevail over any other communications, representations, or agreements unless expressly modified through a written and duly executed contract amendment.

1.2 Scope and Applicability

The provisions of this GCC shall be applicable to all contractual stages, covering project execution, performance obligations, financial commitments, risk allocation, legal compliance, and dispute resolution. It shall govern the SI's responsibilities in system design, procurement, integration, testing, commissioning, and O&M, along with adherence to service levels, cybersecurity, indemnities, insurance, and payment terms. The GCC shall also define the mechanisms for contract enforcement, default provisions, penalties, termination, and exit management.

1.3 Precedence and Interpretation

This GCC shall be read in conjunction with all annexures, schedules, and contract documents forming an integral part of this Contract.

In the event of any ambiguity or inconsistency, the interpretation that best serves the Employer's interests shall prevail.

Any waiver, modification, or deviation from the terms of this GCC shall be valid only if agreed upon in writing and executed as a formal contract amendment.

2 General Provisions

2.1 Definitions

Term	Definition
Acceptance of Work	Shall mean the formal acknowledgment by the Client, upon verification that the works have been completed in accordance with the agreed scope, specifications, and standards prescribed under the Contract. Acceptance shall be subject to compliance with NHAI & IHMCL Guidelines , MoRTH, IRC, IS Codes, and other applicable regulations. The issuance of the Certificate of Completion or any similar formal document shall constitute Acceptance unless otherwise specified in the Contract.
Advance Payment	Shall mean the payment disbursed by the Client to the Contractor as part of the agreed Milestone Payment structure , prior to the commencement of physical works, for enabling mobilization, initial procurement, and project start-up activities. This Advance Payment shall be released against submission of an Advance Bank Guarantee

Term	Definition
	(ABG) of equivalent value, in a format acceptable to the Client. Since this Advance Payment forms an integral part of the Contract Price and Milestone Payment Schedule, it shall not be subject to recovery through subsequent Running Account (RA) Bills. The corresponding Advance Bank Guarantee shall be released after disbursement of the third Milestone Payment, or as otherwise specified in the RFP and Contract Agreement. Any other advance payment made outside the Milestone framework to facilitate execution shall be subject to ABG and shall be recovered from subsequent RA Bills, as per mutually agreed terms.
Agreement	Shall mean the legally binding contract executed between the Employer and the Contractor for the Design, Supply, Installation, Configuration, Integration, Testing, Commissioning and O&M of Advanced Traffic Management System (ATMS). The Agreement includes the General Conditions of Contract (GCC), Special Conditions of Contract (if any), Scope of Work, Technical Specifications, Drawings, and all amendments, modifications, addenda, and correspondences mutually agreed upon by both parties, forming an integral part of the contract.
Alternative Dispute Resolution (ADR)	A structured mechanism for resolving disputes between the Employer and the Contractor outside of formal litigation, including but not limited to mediation, conciliation, and arbitration, as defined in the Dispute

Term	Definition
	Resolution Clause of this Contract. The ADR process shall be conducted in accordance with the Arbitration and Conciliation Act, 1996 (as amended) and any other applicable laws or contractual provisions agreed upon by both parties.
Alternative Works	Any additional, substitute, or modified works required to be executed by the Contractor due to design changes, revised specifications, unforeseen site conditions, or Employer's instructions , subject to approval under the Variation & Change Order process of the Contract. All Alternative Works shall comply with applicable NHAI & IHMCL Guidelines, MoRTH, IRC, and statutory regulations , ensuring technical integrity and contractual adherence.
Annual Performance Review	A structured evaluation conducted by the Employer to assess the Contractor's performance in operating, maintaining, and managing the Advanced Traffic Management System (ATMS) . The review shall be based on Service Level Agreements (SLAs), system availability, response times, incident management efficiency, maintenance effectiveness, and regulatory compliance . The outcome of the review may result in corrective actions, penalties as per the contractual provisions.
Arbitration	A legally binding dispute resolution mechanism conducted by an independent arbitral tribunal in accordance with the Arbitration and Conciliation Act, 1996 (as amended) and the Dispute Resolution Clause of the Contract. The arbitration proceedings

Term	Definition
	shall be governed by the rules and procedures specified in the Contract, ensuring a fair and impartial resolution. The seat and venue of arbitration shall be as stipulated in the Agreement, and the arbitral award shall be final and binding on both parties.
Bank Guarantee	A financial security instrument issued by a scheduled or nationalized bank in favor of the Employer, securing the Contractor's obligations under the Contract. This may include, but is not limited to, the Performance Bank Guarantee (PBG), Advance Payment Guarantee, or any other guarantee required under the Contract. The terms of validity, encashment, and release shall be as per the Contract conditions.
Bid Price	The total price submitted by the Contractor in response to the Request for Proposal (RFP), covering all costs associated with the Design, Supply, Installation, Configuration, Integration, Testing, Commissioning and O&M of Advanced Traffic Management System (ATMS). The Bid Price shall be inclusive of all applicable duties, taxes, levies, overheads, and any other financial components unless explicitly stated otherwise excluding Goods and Services Tax (GST), which shall be payable separately as per applicable laws. Adjustments to the Bid Price shall be made as per the Contract provisions.
Bill of Quantities (BoQ)	A structured document providing a detailed breakdown of work items, their descriptions, estimated quantities, unit rates, and total cost estimates for execution under the Contract.

Term	Definition
Certificate of Completion	The BoQ serves as the basis for bid evaluation, interim payments, and variation assessments. The quantities in the BoQ are indicative and subject to modifications as per actual site conditions, with adjustments governed by the Variation & Change Order provisions of the Contract. A formal document issued by the Employer or its authorized representative upon satisfactory completion of the specified works, certifying compliance with the contractual requirements. The certificate confirms that all deliverables, including installation, testing, commissioning, and performance validation of the ATMS, have been executed in accordance with the approved technical specifications, NHAI & IHMCL Guidelines, MoRTH/IRC standards, and contractual obligations. Issuance of this certificate is a prerequisite for final payment release.
Commencement Date	The date specified in the Contract from which the Contractor is required to commence execution of the works, including mobilization, resource deployment, procurement, and site preparations. The Commencement Date shall be determined based on the issuance of the Letter of Acceptance (LOA), execution of the Contract Agreement, and fulfillment of preconditions such as submission of the Performance Bank Guarantee (PBG) or other required securities.
Compensation Event	An event or circumstance that entitles the Contractor to claim additional time, costs, or both, as per the Contract provisions. Compensation Events may include changes in

Term	Definition
	law, force majeure events, unforeseen site conditions, delays in approvals attributable to the Employer, or any other contractual modifications that impact the Contractor's obligations. The entitlement for compensation shall be subject to substantiation and approval by the Employer, in accordance with the provisions set forth in the Contract.
Completion Date	The date by which the Contractor is contractually required to complete all works, including installation, integration, testing, and commissioning of the ATMS, as per the agreed schedule. The Completion Date shall be determined based on the issuance of the Certificate of Completion by the Employer, confirming that all contractual requirements have been fulfilled. Delays beyond the Completion Date shall be subject to Liquidated Damages unless an approved extension is granted under a Compensation Event.
Confidential Information	Any data, documents, specifications, business strategies, proprietary technology, software, or any other non-public information exchanged between the Employer and the Contractor in relation to the execution of the Contract. Confidential Information shall not be disclosed, shared, or used for any purpose other than Contract execution without prior written approval from the disclosing Party. Protection of Confidential Information shall be governed by applicable laws, including the Indian Contract Act, 1872 , the Information Technology Act, 2000 , and any signed Non-Disclosure Agreement (NDA) .

Term	Definition
Contract Price	The total amount agreed upon between the Employer and the Contractor for the execution of works under the Contract, covering all costs related to the design, supply, installation, testing, commissioning, and operation & maintenance of the ATMS. The Contract Price shall include all applicable taxes, duties, overheads, and any other financial obligations unless explicitly stated otherwise. Adjustments to the Contract Price shall be governed by the provisions related to Price Adjustment, Variation & Change Orders , and Compensation Events .
Construction Works	All civil, structural, electrical, mechanical, and IT infrastructure-related works required for the successful implementation of the ATMS. This includes, but is not limited to, installation of field sensors, cameras, variable message signs (VMS), and control center equipment, as per the approved technical specifications. All Construction Works shall be executed in compliance with MoRTH, IRC, IS Codes, and other applicable regulatory standards .
Defects Liability Period (DLP)	The Defects Liability Period (DLP) shall commence from the date of issuance of the Commissioning Certificate and shall continue for the duration specified in the Contract. During this period, the Contractor shall be liable for identifying and rectifying defects, failures, or non-conformities in materials, workmanship, software, or system performance. The scope of DLP shall cover field equipment, ATMS software, communication networks, sensors, controllers, servers, and associated infrastructure , ensuring

Term	Definition
	compliance with the Employer's Requirements. The DLP shall run concurrently with the Comprehensive Operation & Maintenance Contract during the first year, where applicable, with both governed by distinct Service Level Agreements (SLAs) and performance criteria. Failure to address defects within the stipulated time shall attract penalties, deductions, or encashment of the Performance Bank Guarantee (PBG) as per Contract terms.
Dispute Resolution Procedure	The structured contractual mechanism for addressing and resolving disputes, claims, or disagreements between the Employer and the Contractor. The procedure shall adhere to the Indian Arbitration and Conciliation Act, 1996 (as amended) or any other governing framework specified in the Contract. Dispute resolution may involve negotiation, mediation, conciliation, arbitration, or litigation, following a tiered escalation process to ensure disputes are addressed without undue disruption to the execution of the works. The arbitral tribunal's decision shall be final and binding unless challenged in accordance with applicable laws.
Employer / Client	Shall refer to NHIT (National Highways Infra Trust) and its subsidiaries, legal successors, assignees, and authorized officers responsible for the administration, oversight, and execution of the Contract. The Employer shall be entitled to all rights and remedies as specified in the Agreement, including but not limited to

Term	Definition
Employer's Representative	approvals, contract modifications, penalties, and termination rights. The individual, firm, or entity formally appointed and authorized in writing by the Employer to oversee, supervise, and administer the ATMS Contract. The Employer's Representative shall have the authority to: • Review, approve, or reject contractor submissions. • Monitor compliance with the Contract, issue instructions, and approve variations. • Certify payment milestones based on satisfactory completion of deliverables. • Coordinate dispute resolution processes under the Contract. The Contractor shall recognize an individual or entity as the Employer's Representative only if formally communicated in writing through a Letter of Authorization, Contract Agreement, or any other official correspondence. Any directives or approvals from unauthorized personnel shall not be contractually binding unless validated by the Employer.
Final Payment	The last and conclusive payment due to the Contractor upon successful completion of all contractual obligations, including: • Completion of all ATMS works and systems testing. • Submission and acceptance of the Final Statement of Accounts and No-Dues Certificate. • Closure of any outstanding penalties, claims, or deductions.

Term	Definition
	Final Payment shall only be processed upon issuance of the Final Completion Certificate by the Employer. Once the Final Payment is made, no further financial claims shall be entertained unless explicitly provided for in the Contract.
Final Settlement	The last and conclusive payment due to the Contractor upon successful completion of all contractual obligations, including: • Completion of all ATMS works and systems testing. • Submission and acceptance of the Final Statement of Accounts and No-Dues Certificate. • Closure of any outstanding penalties, claims, or deductions. Final Payment shall only be processed upon issuance of the Final Completion Certificate by the Employer. Once the Final Payment is made, no further financial claims shall be entertained unless explicitly provided for in the Contract.
Indemnity	Shall mean the Contractor's legal obligation to protect, defend, and compensate the Employer against any losses, damages, claims, penalties, or liabilities arising from the Contractor's negligence, errors, omissions, breach of contract, or failure to meet contractual and regulatory obligations. The indemnity shall extend to third-party claims, including but not limited to property damage, personal injury, intellectual property violations, or non-compliance with applicable laws and industry standards. The indemnification obligation shall remain valid throughout the

Term	Definition
Insurance	contract duration and shall survive its completion or termination. The Contractor shall bear full responsibility for legal costs, settlements, or damages imposed on the Employer due to its actions or omissions. The Employer shall have the right to recover any indemnified amounts from the Contractor, including by way of deductions from payments due or encashment of the Performance Bank Guarantee (PBG), as specified in the Contract.
	shall mean the mandatory insurance policies that the Contractor must obtain and maintain throughout the Contract duration, covering all risks associated with the execution, installation, operation, and maintenance of the ATMS. The Contractor shall ensure distinct insurance coverage for: Installation Period: The Contractor shall procure and maintain insurance coverage for all materials, equipment, and infrastructure owned by the Contractor during the implementation period. This shall include protection against fire, theft, vandalism, power surge, network surge, lightning, flood, storm, Force Majeure events, or any other perceived risks or natural disasters. The Contractor shall be solely responsible for claiming insurance and replacing any damaged components or systems during the implementation period until the commencement of the O&M phase. O&M Period: Upon successful completion of Site Acceptance Tests (SAT), Commissioning (including closure of all Punch Points), and issuance of the Final Acceptance Certificate, the insurance liability for TMS equipment shall

Term	Definition
	be transferred to the Employer. However, the Contractor shall maintain separate insurance for its workforce, including subcontractor personnel, as per applicable laws. The Contractor shall also obtain and maintain comprehensive insurance for all personnel deployed under this Contract, ensuring coverage for medical expenses, transportation, wages, and compensation in the event of any incident, accident, mishap, or death occurring on-site or in transit, irrespective of the cause. In cases where insurance coverage is not provided by the insurer, the Contractor shall bear full responsibility for the associated expenses and compensation. The Contractor shall maintain insurance coverage for personnel, third-party liability, professional liability insurance, employer's liability insurance, motor vehicle insurance, and comprehensive general liability insurance throughout the entire Contract duration, including the O&M period. Any failure to maintain the required insurance coverage shall be treated as a contractual breach, subject to penalties as specified in the Contract.
Liquidated Damages	Shall mean the pre-agreed financial penalties imposed on the Contractor for failure to meet contractual obligations, including delays in project execution, non-performance, or non-compliance with service levels specified in the Contract. Liquidated Damages shall apply when the Contractor fails to achieve milestone targets, commissioning deadlines, or specified system performance parameters. The

Term	Definition
	calculation and application of Liquidated Damages shall be governed by the terms of the Contract and shall not preclude the Employer from seeking additional remedies, including termination, encashment of the Performance Bank Guarantee (PBG), or initiation of legal action. The maximum limit for Liquidated Damages, as well as any grace periods or mitigation provisions, shall be explicitly stated in the Contract. The Employer shall have the sole discretion to levy such penalties, and any deductions made shall not relieve the Contractor of its remaining obligations.
Maintenance Obligations	Shall mean the Contractor's responsibility to ensure the proper functioning, upkeep, and defect rectification of the ATMS and all associated hardware and software components, as per the contractual terms. Maintenance obligations shall remain in force during the Defects Liability Period (DLP), Operation & Maintenance (O&M) Contract, and any extended service period agreed upon under the Contract. The scope of maintenance shall include preventive and corrective maintenance, real-time system monitoring, firmware and software updates, calibration, hardware replacements, and compliance with the Service Level Agreement (SLA) to ensure uninterrupted system uptime and efficiency. The Contractor shall establish a dedicated maintenance team, respond to failures within stipulated rectification timelines, and maintain records of all maintenance activities. Any failure to meet Maintenance Obligations, including delays in rectification or repeated

Term	Definition
	system failures, shall result in penalties, deductions, or encashment of the Performance Bank Guarantee (PBG), as per the contractual provisions.
Mobilization	Shall mean the preparatory phase undertaken by the Contractor immediately following the issuance of the Notice to Proceed (NTP), involving the deployment of manpower, procurement of materials, and mobilization of equipment to ensure timely commencement of work. Mobilization shall include establishing site offices, securing necessary statutory approvals, setting up IT infrastructure, conducting safety briefings, and ensuring environmental compliance. The Contractor shall be required to complete all mobilization activities within the specified timeframe, failing which penalties may be imposed as per the Contract. Any delay in mobilization beyond the prescribed period shall be treated as a contractual breach and may lead to deductions from interim payments or encashment of the Performance Security.
No Dues Certificate	Shall mean an official document issued by the Contractor to the Client (or vice versa), confirming that there are no outstanding financial claims, obligations, or liabilities remaining between the parties under the Contract as of the date of issuance. This certificate is generally submitted at the time of contract closure, final payment, or termination, and serves as a declaration that all payments, settlements, taxes, dues, and obligations (including those related to manpower, equipment, subcontractors, and statutory

Term	Definition
	compliances) have been duly fulfilled and no further claims shall be raised by the issuing party.
Order of Precedence	shall mean the structured hierarchy of contractual documents established to resolve any discrepancies, contradictions, or conflicts in interpretation. The sequence of precedence is explicitly defined in the Contract to ensure clarity and consistency in enforcement. In case of any inconsistency, the document appearing higher in the hierarchy shall take precedence over those listed subsequently. Unless otherwise specified, the standard order of precedence shall be as follows: (i) The Contract Agreement, including amendments and addenda; (ii) The Particular Conditions of Contract (PCC), if applicable; (iii) The General Conditions of Contract (GCC); (iv) Any Corrigenda, Clarifications, or Pre-bid Responses issued by the Employer; (v) The Employer's Request for Proposal (RFP) and its Annexures; (vi) The Technical Specifications, Functional Requirements, and Drawings; (vii) The Contractor's Technical and Financial Proposal, to the extent accepted by the Employer; and (viii) Any other mutually agreed document. In cases where a general provision conflicts with a specific provision within the same document, the more specific provision shall prevail. The Employer's interpretation shall be final and binding in resolving any disputes regarding document precedence, subject to applicable laws and contractual remedies.

Term	Definition
Payment Milestones	Shall mean the predefined stages at which payments shall be made to the Contractor, linked to measurable progress in project execution and fulfillment of contractual deliverables. Payment milestones shall be based on key activities such as procurement, supply, installation, testing, commissioning, and system handover. Each milestone shall be subject to verification, certification by the Employer's Representative, and compliance with contractual requirements. Failure to meet the prescribed conditions may lead to deferment or deductions in payments as per the Contract terms.
Penalties for SLA Non-Compliance	Shall mean the financial deductions or other contractual consequences imposed on the Contractor for failing to meet the Service Level Agreement (SLA) obligations as stipulated in the Contract. SLA non-compliance may include excessive system downtime, delayed response to maintenance issues, failure to meet uptime guarantees, or deviations from performance benchmarks. The penalties shall be determined based on predefined formulas, deduction percentages, or other conditions specified in the SLA. Persistent non-compliance may lead to further consequences such as encashment of the Performance Bank Guarantee (PBG), termination of the Contract, or disqualification from future projects.
Request for Proposal (RFP)	Shall mean the formal solicitation document issued by the Employer for the <i>Selection of a System Integrator for the Design, Supply, Installation, Configuration, Integration, Testing, Commissioning, and Operation & Maintenance</i>

Term	Definition
Society for Affordable Resolution of Disputes (SAROD)	(O&M) of the Advanced Traffic Management System (ATMS). The RFP defines the project's scope, technical specifications, eligibility criteria, evaluation methodology, compliance requirements, and contractual obligations, including the Service Level Agreement (SLA) governing the system's performance during the O&M period. It forms a key part of the Contract and establishes the foundation for all obligations undertaken by the Contractor in implementing and maintaining the ATMS as per the Employer's requirements. Shall mean the institutional arbitration and dispute resolution mechanism applicable to infrastructure contracts under the Ministry of Road Transport and Highways (MoRTH) and the National Highways Authority of India (NHAI). SAROD provides an alternative dispute resolution (ADR) framework for settling disputes arising from ATMS implementation, maintenance, and performance-related contractual issues. Arbitration under SAROD shall be conducted in accordance with the Arbitration and Conciliation Act, 1996, as amended, and its decisions shall be binding, subject to legal recourse where applicable.
Service Level Agreement (SLA)	Shall mean the legally binding section of the Contract that defines the operational performance standards, system availability requirements, response and resolution times for ATMS components, and penalties for non-compliance. The SLA shall govern the Contractor's obligations during the Operation & Maintenance (O&M) period, ensuring compliance with uptime guarantees, fault

Term	Definition
	rectification timelines, data accuracy standards, and periodic maintenance schedules for ATMS infrastructure, including surveillance systems, variable message signs (VMS), speed enforcement cameras, and incident detection systems. Any failure to meet SLA benchmarks shall be subject to financial deductions or corrective actions as defined in the Contract.
Site Safety	Shall mean the set of health, safety, and environmental (HSE) standards, risk mitigation measures, and regulatory compliance obligations that the Contractor must adhere to during the installation, commissioning, and operation of the ATMS. The Contractor shall ensure the safe deployment of field equipment, including cameras, sensors, gantries, and communication infrastructure, in compliance with national and international safety norms. Site safety responsibilities include worker protection, traffic diversion planning, temporary barricading, adherence to road safety guidelines, and emergency preparedness protocols. Any breach of Site Safety requirements may lead to penalties, work suspension, or termination of the Contract, as determined by the Employer.
Substantial Completion	Shall mean the stage at which the ATMS has been installed, tested, and commissioned to a level that allows the system to function for its intended purpose, subject to minor pending works or defects that do not materially impact performance. Substantial Completion shall be certified by the Employer's Representative based on system acceptance tests (SAT),

Term	Definition
System Handover Process	functional verification, and operational readiness of core ATMS components, including traffic monitoring, data processing, enforcement mechanisms, and control center integration. Upon achieving Substantial Completion, a Provisional Completion Certificate may be issued, with the Contractor required to rectify any pending issues within the defined Defect Liability Period (DLP). Non-compliance with rectification timelines may result in deductions or other contractual remedies. Shall mean the structured procedure for the formal transfer of operational control and ownership of the <i>Advanced Traffic Management System (ATMS)</i> from the Contractor to the Employer upon successful completion of contractual obligations. This process includes final inspections, system validation, documentation of installed components, training of Employer's personnel, submission of as-built drawings, software source codes (where applicable), operating manuals, and issuance of the Final Acceptance Certificate. The handover shall not be deemed complete until all performance guarantees, defect rectifications, and post-commissioning obligations are fulfilled as per the Contract.
System Integrator	Shall mean the entity engaged under the Contract for the <i>Design, Supply, Installation, Configuration, Integration, Testing, Commissioning, and Operation & Maintenance (O&M) of the Advanced Traffic Management System (ATMS)</i>. The System Integrator shall be responsible for ensuring seamless integration

Term	Definition
	of hardware, software, communication networks, and third-party interfaces, meeting the Employer's functional and performance requirements. Additionally, the System Integrator shall be accountable for data security, compliance with regulatory standards, and maintaining service uptime as per the Service Level Agreement (SLA).
Work Order	Shall mean the formal directive issued by the Employer to the Contractor, instructing the commencement of specific works under the Contract. Each Work Order shall specify the scope of work, deliverables, timelines, required approvals, and any specific execution conditions. The Contractor shall be responsible for timely execution and compliance with all contractual provisions stated in the Work Order, and failure to adhere may result in penalties or other contractual remedies as per the Agreement.

Technical Term	Description
Access Control Mechanism	Shall mean the security framework implemented within the Advanced Traffic Management System (ATMS) to regulate, authenticate, and monitor access to system components, control centers, and restricted zones. The Access Control Mechanism shall include role-based authentication, biometric or RFID-based entry systems, cybersecurity protocols, and encrypted access credentials to prevent unauthorized system modifications or data breaches. The Contractor shall ensure compliance with cybersecurity regulations and periodic security audits as per contractual requirements.

Technical Term	Description
ATMS Control Center with ATMS Software Platform	Shall mean the centralized facility housing the servers, operator workstations, video walls, and communication systems for real-time traffic monitoring, control, and data management. The ATMS Software Platform hosted at the center integrates field equipment, analytics, reporting tools, and user interfaces to enable efficient operation, maintenance, and enforcement of traffic management services.
Audit Trail	Shall mean the automated, tamper-proof logging system embedded within ATMS software to record and track all user activities, modifications, data transactions, and system alerts. The Audit Trail shall capture details such as user ID, timestamp, action performed, and system response to ensure transparency, accountability, and forensic analysis in case of discrepancies. The Contractor shall maintain and provide access to the audit trail logs as per Employer requirements and applicable regulatory guidelines.
Automatic Number Plate Recognition (ANPR)	Shall mean the image-processing technology deployed in ATMS to capture, recognize, and process vehicle registration numbers for enforcement, traffic monitoring, and congestion analysis. The ANPR system shall be integrated with law enforcement databases, toll collection systems, and traffic violation enforcement mechanisms for real-time vehicle identification. The Contractor shall ensure high-precision number plate recognition, even under adverse lighting, weather, and high-speed conditions, as per applicable regulatory standards.
Commissioning	Shall mean the structured process of testing, verifying, and officially activating the installed ATMS components to ensure compliance with

Technical Term	Description
	contractual performance standards and operational requirements. Commissioning shall include system integration tests, field trials, calibration, and validation of all software, hardware, and communication networks before final acceptance by the Employer. The Contractor shall be responsible for documenting test results, rectifying deficiencies, and obtaining Employer certification before declaring the system operational.
Corrective Maintenance	Shall mean the reactive maintenance activity undertaken to diagnose, repair, or replace defective ATMS components that have malfunctioned or failed during operations. Corrective Maintenance shall be executed as per predefined SLAs and shall include fault isolation, hardware/software rectifications, firmware updates, and system recalibration. The Contractor shall maintain adequate spare parts, deploy trained personnel, and restore functionality within the response and resolution times specified in the Contract.
Cybersecurity Framework for ATMS	<i>Shall mean</i> the structured set of policies, protocols, and security measures implemented to safeguard the Advanced Traffic Management System (ATMS) from cyber threats, unauthorized access, and data breaches. The framework shall include encryption standards, network security protocols, intrusion detection systems, role-based access controls, and compliance with national and international cybersecurity regulations.
Data Backup & Archiving	Shall mean the systematic process of storing, securing, and retaining ATMS-generated data for operational continuity, analysis, and regulatory compliance. Data Backup shall include periodic replication of critical system logs, incident records,

Technical Term	Description
	traffic flow data, and enforcement footage to secure storage locations. Data Archiving shall ensure the long-term preservation of historical records for audit, legal, and analytical purposes. The Contractor shall implement automated backup mechanisms, disaster recovery protocols, and data retention policies as per industry best practices and contractual requirements.
Data Encryption Protocols	Shall mean the security measures implemented to protect ATMS data from unauthorized access, tampering, and cyber threats. The Contractor shall ensure end-to-end encryption of data during transmission and storage, using industry-standard encryption algorithms such as AES, RSA, or ECC. All communication between ATMS components, including ANPR, AVCS, and central servers, shall be encrypted as per the latest cybersecurity guidelines. The Employer reserves the right to audit encryption compliance periodically.
Data Security & Access Control	Shall mean the policies, technologies, and mechanisms implemented to safeguard ATMS data integrity, confidentiality, and availability. The Contractor shall establish a multi-layered security framework, including user authentication, role-based access control (RBAC), intrusion detection, and secure login mechanisms. All access to ATMS databases, logs, and control interfaces shall be restricted to authorized personnel only. Any breach of data security shall be reported immediately, and corrective measures shall be implemented as per contractual obligations.
Design Documents	Shall mean the set of technical drawings, schematics, architecture layouts, and functional specifications that define the ATMS infrastructure, hardware placement, software configuration, and

Technical Term	Description
	integration strategy. The Contractor shall prepare, submit, and update all Design Documents in compliance with the Employer's requirements, ensuring accuracy and alignment with project scope. The final Design Documents shall include system architecture diagrams, data flow models, component specifications, and interface details necessary for seamless implementation and future upgrades.
Disaster Recovery (DR) Plan	Shall mean the structured strategy developed to ensure business continuity and system restoration in case of ATMS failures due to natural disasters, cyber-attacks, or technical malfunctions. The Contractor shall design and implement a DR Plan covering redundant infrastructure, data replication, backup procedures, failover mechanisms, and emergency response protocols. The DR Plan shall be periodically tested through mock drills, and the Contractor shall ensure a predefined recovery time objective (RTO) and recovery point objective (RPO) as per the Contract.
Edge Computing in ATMS	Shall mean the distributed computing methodology wherein data processing and analysis are performed closer to the source, such as at intersections, surveillance cameras, or toll plazas, rather than relying solely on central servers. Edge computing shall enhance real-time decision-making, reduce latency, improve response times for traffic management applications, and optimize the efficiency of ATMS components, including AI-based traffic monitoring, emergency response systems, and adaptive signal control.
End-of-Day (EOD) Reports	Shall mean the comprehensive daily reports generated by the ATMS, summarizing system operations, traffic incidents, equipment uptime,

Technical Term	Description
	maintenance activities, and any anomalies detected within the system. The Contractor shall configure the ATMS to automatically generate and archive EOD Reports, which shall be accessible to authorized personnel. The report format, data fields, and submission timelines shall be defined by the Employer, ensuring compliance with operational monitoring and audit requirements.
Exit Management Plan	Shall mean the structured procedure defined in the Contract for the orderly transition of ATMS operations, data, and assets from the Contractor to the Employer or a successor entity upon contract expiry or termination. The Exit Management Plan shall include data handover protocols, decommissioning procedures, knowledge transfer sessions, and system documentation submissions. The Contractor shall cooperate in facilitating a seamless transition, ensuring that all contractual obligations related to service continuity and asset transfer are met without disruption.
Factory Acceptance Test (FAT)	Shall mean the pre-delivery inspection and validation process conducted at the manufacturer's facility to verify that ATMS equipment, including sensors, cameras, controllers, and software, meets specified functional, performance, and quality standards. The FAT shall be conducted in the presence of the Employer's representative, and test results shall be documented for approval before dispatch. The Contractor shall rectify any non-compliance or defects identified during FAT before proceeding with equipment installation at the project site.
Failure Response Time	Shall mean the maximum allowable duration within which the Contractor must acknowledge, diagnose, and initiate corrective actions upon detection of an

Technical Term	Description
	ATMS component failure. Failure Response Time shall be classified based on severity levels, with critical system failures requiring immediate intervention and minor faults addressed within defined SLA timelines. The Contractor shall implement automated fault detection mechanisms, real-time alerts, and escalation procedures to ensure adherence to contractual Failure Response Time obligations.
Future-proofing	Shall mean the design and implementation approach ensuring that the ATMS remains adaptable to technological advancements, regulatory changes, and evolving operational requirements. The Contractor shall adopt scalable architectures, modular hardware configurations, and upgradable software frameworks to facilitate seamless integration with future innovations. Compliance with open standards, interoperability protocols, and cybersecurity best practices shall be ensured to maximize the system's longevity and effectiveness.
Handover Process	Shall mean the structured set of activities governing the formal transfer of ATMS components, operational responsibilities, and documentation from the Contractor to the Employer upon project completion or contract termination. The Handover Process shall include system validation, training of designated personnel, submission of as-built documentation, software licensing transfers, and compliance verification with contractual requirements. The handover shall only be considered complete upon acceptance by the Employer's Representative.

Technical Term	Description
Incident Reporting & Resolution	Shall mean the systematic process for logging, investigating, and addressing traffic-related incidents detected by the ATMS. The Contractor shall ensure that the ATMS features an automated Incident Reporting System capable of classifying incidents based on severity, generating real-time alerts, and initiating response workflows. Incident data shall be archived for audit purposes, and resolution timelines shall be monitored to ensure adherence to the Service Level Agreement (SLA).
Incident Response Plan	Shall mean the predefined set of procedures detailing the coordinated actions to be taken by ATMS operators, emergency responders, and enforcement agencies in the event of traffic incidents, system malfunctions, or security breaches. The Incident Response Plan shall specify communication protocols, escalation hierarchies, response timelines, and resource deployment strategies to minimize disruptions and ensure rapid resolution of incidents. The Contractor shall be responsible for training personnel and conducting periodic drills to validate the effectiveness of the plan.
Innovation	Shall mean the adoption of advanced technologies, data-driven decision-making, and process improvements to enhance the efficiency, accuracy, and scalability of the ATMS. The Contractor shall integrate emerging technologies such as Artificial Intelligence (AI), Machine Learning (ML), predictive analytics, and cloud-based solutions to optimize traffic monitoring, incident detection, and response mechanisms. Continuous innovation shall be encouraged to ensure long-term operational excellence

Technical Term	Description
Integration Testing	Shall mean the systematic process of validating the interoperability and functional compatibility of various ATMS components, including hardware, software, network infrastructure, and third-party systems. The Contractor shall conduct Integration Testing in a controlled environment to verify seamless communication between subsystems, data consistency, and compliance with contractual performance benchmarks before full-scale deployment.
Interoperability Standards	Shall mean the set of industry-recognized protocols, data formats, and communication interfaces that ensure seamless integration of ATMS components with external systems, including law enforcement databases, emergency response units, and urban traffic management platforms. The Contractor shall ensure compliance with relevant national and international interoperability standards, facilitating smooth data exchange and operational coordination.
Lane Discipline Enforcement System	Shall mean the automated monitoring and enforcement system designed to ensure adherence to designated lane usage rules by different categories of vehicles. The system shall utilize AI-powered cameras, sensors, and real-time analytics to detect lane violations, such as unauthorized lane changes and lane hogging, and shall trigger automated alerts and penalties in accordance with traffic regulations.
Mean Time to Repair (MTTR)	Shall mean the average time required to diagnose, repair, and restore ATMS components or subsystems to full functionality following a failure. MTTR shall be measured from the time an issue is reported until it is fully resolved, excluding waiting times for parts or approvals. The Contractor shall be

Technical Term	Description
	responsible for maintaining an efficient maintenance response framework to minimize MTTR and ensure uninterrupted system availability as per SLA requirements.
Operational Uptime	Shall mean the percentage of time the ATMS remains fully functional and available for use, excluding scheduled maintenance. The Contractor shall ensure that all system components, including surveillance cameras, sensors, communication networks, and data processing units, meet the minimum uptime requirements as specified in the SLA. Any downtime beyond the permissible limit shall be subject to penalties as per the Contract.
Operation & Maintenance (O&M) Contract	shall mean the comprehensive scope of activities to be undertaken by the Contractor for the effective, efficient, and uninterrupted functioning of the Advanced Traffic Management System (ATMS) deployed across the project corridor. This includes but is not limited to: day-to-day operations of control centres and field equipment; routine and preventive maintenance of hardware and software components; replacement of damaged or non-functional parts as required to maintain service levels; fault detection and rectification; technical support; data integrity and cybersecurity management; ensuring system uptime and performance benchmarks; coordination with enforcement and emergency agencies; and compliance with Service Level Agreements (SLAs) and other functional requirements as specified in the RFP and Contract Agreement. The Contractor shall also be responsible for deployment of skilled manpower, incident management support, reporting, and handing over of assets in fully

Technical Term	Description
	functional condition at the end of the contract period.”
Optical Fiber Cable (OFC)-based Digital Communication System	A high-speed, secure, and scalable digital communication infrastructure using optical fiber technology to establish connectivity between the ATMS Control Center and various roadside equipment. This system ensures real-time transmission of video, sensor data, command and control signals, and supports integration with external systems.
Preventive Maintenance	Shall mean the proactive approach to maintaining ATMS components through regular inspections, software updates, calibration, and replacement of parts before potential failures occur. The Contractor shall develop a detailed Preventive Maintenance schedule, ensuring system reliability, compliance with warranty conditions, and mitigation of unforeseen downtimes.
Quality Standards for ATMS	Shall mean the set of national and international benchmarks governing the design, installation, performance, operation, and maintenance of ATMS components, ensuring reliability, efficiency, and compliance with regulatory frameworks. The Contractor shall ensure adherence to standards such as: • NHA/Policy Guidelines/ Standard Documents/2023, Policy Circular No.11.53/2023 dated 10th October 2023 • Indian Roads Congress (IRC) guidelines for traffic management systems and electronic enforcement. • Bureau of Indian Standards (BIS) for electrical, electronic, and structural components used in ATMS infrastructure.

Technical Term	Description
	• National Electrical Code (NEC) for safety, grounding, and power management of ATMS hardware. • ISO 9001 for quality management in the implementation and maintenance of ATMS. • ISO/IEC 27001 for data security and cybersecurity measures in ATMS networks. • ISO 14001 for environmental compliance in ATMS implementation and maintenance. • NEMA TS-2 for traffic controller assemblies and roadside equipment performance. • ITU-T standards for communication protocols used in ATMS, including data transmission, CCTV integration, and real-time monitoring. The Contractor shall be responsible for obtaining necessary compliance certifications, conducting periodic quality audits, and ensuring that all installed components and software solutions meet the prescribed standards. Any non-compliance shall be subject to corrective measures, including rectification, replacement, or penalties as per the Contract.
Real-Time Monitoring Dashboard	Shall mean the centralized interface within the ATMS that provides real-time data visualization, alerts, and analytics for traffic conditions, system health, incident detection, and enforcement activities. The dashboard shall integrate multiple ATMS subsystems, including CCTV feeds, Automatic Incident Detection (AID), Speed Enforcement, and ANPR, offering a comprehensive operational view to traffic management authorities. The Contractor shall ensure that the dashboard is accessible via secured web and mobile platforms with role-based access control and historical data retrieval capabilities.

Technical Term	Description
Remote Diagnostics & Troubleshooting	Shall mean the capability within the ATMS that enables real-time monitoring, fault detection, and resolution of system issues remotely, without the need for on-site intervention. It shall include automated health checks, predictive maintenance alerts, remote firmware and software updates, and system performance analytics to ensure optimal operation and minimal downtime.
Service Level Agreement (SLA)	Shall mean the contractual document that defines the performance metrics, operational uptime, response times, and maintenance obligations for the ATMS. The SLA shall specify key service benchmarks such as system availability, incident response time, data accuracy levels, and penalties for non-compliance. The Contractor shall be responsible for maintaining the ATMS components as per the defined SLA, ensuring seamless operations and adherence to contractual obligations.
System Acceptance Test (SAT)	Shall mean the final stage of system validation performed at the project site before commissioning the ATMS. The SAT shall include comprehensive functional and performance testing of all ATMS components, ensuring compliance with contract specifications, integration with existing infrastructure, and readiness for live operations. The Contractor shall document and submit SAT reports, which must be approved by the Employer before the issuance of the Final Acceptance Certificate.
Speed Enforcement System	Shall mean the ATMS sub-system designed to detect, capture, and process instances of vehicles exceeding the prescribed speed limits. The system shall utilize radar-based or camera-based speed detection technologies, integrated with ANPR for vehicle identification. The Speed Enforcement

Technical Term	Description
	System shall generate enforceable evidence, including speed data, vehicle images, and timestamps, facilitating automatic penalty processing and legal compliance. The Contractor shall ensure that the system meets accuracy and evidentiary standards set by traffic enforcement authorities.
System Availability	Shall mean the percentage of time the ATMS remains operational and accessible for use as per the defined Service Level Agreement (SLA). System Availability shall be calculated based on the uptime of core components, including Automatic Incident Detection (AID), ANPR, RLVD, Speed Enforcement, and the Real-Time Monitoring Dashboard. The Contractor shall ensure redundancy mechanisms, failover strategies, and proactive maintenance to achieve the agreed-upon availability targets. Any downtime beyond the permissible limits shall be subject to penalties as per the Contract.
System Commissioning	shall mean the formal process of validating, testing, and certifying that all components of the Advanced Traffic Management System (ATMS)—including hardware, software, communication systems, sensors, cameras, control centre infrastructure, and system integrations—have been installed, configured, and are fully operational in accordance with the technical specifications, performance requirements, and functional expectations defined in the RFP and Contract Agreement. The process includes factory acceptance testing (FAT), site acceptance testing (SAT), end-to-end functional validation, data accuracy checks, uptime performance, and integration with third-party systems. Successful commissioning shall be deemed complete only upon joint verification by

Technical Term	Description
	the Employer or its nominated representative and issuance of a Commissioning Certificate. From the date of commissioning, the Operation & Maintenance (O&M) phase shall commence.”
System Hardening Standards	Shall mean the set of security measures, configurations, and best practices implemented to protect the ATMS infrastructure from cyber threats, unauthorized access, and vulnerabilities. System Hardening shall include encryption protocols, secure firmware updates, network segmentation, multi-factor authentication, and regular security audits. The Contractor shall ensure compliance with national and international cybersecurity standards, such as ISO 27001 and NIST guidelines, to safeguard system integrity and operational continuity.
Takeover Certificate	Shall mean the formal document issued by the Employer upon successful completion of the System Handover Process, signifying that the ATMS has met the contractual requirements for operational deployment. The Takeover Certificate shall be issued following the successful completion of the Site Acceptance Test (SAT), rectification of punch list items, and submission of all technical documentation, training materials, and warranties. The issuance of this certificate shall mark the start of the Defect Liability Period (DLP) and the commencement of operational responsibilities under the Operation & Maintenance (O&M) Contract.
Technology Refresh Plan	Shall mean the strategic framework defined in the Contract to ensure periodic upgrades and replacements of ATMS components to maintain technological relevance, system efficiency, and compliance with evolving industry standards. The Contractor shall be responsible for evaluating

Technical Term		Description
		hardware and software obsolescence, proposing enhancements, and executing technology refresh cycles at predefined intervals to prevent system degradation. The plan shall cover firmware updates, server infrastructure upgrades, sensor calibration, and AI-driven analytics improvements while ensuring minimal operational disruptions.
Traffic Data Analytics System		Shall mean the ATMS module responsible for collecting, processing, and analyzing real-time and historical traffic data to generate actionable insights for traffic management, congestion mitigation, and policy planning. The Traffic Data Analytics System shall leverage machine learning algorithms, predictive modeling, and big data visualization techniques to enhance decision-making for traffic authorities. The system shall provide reports on vehicle flow, speed patterns, violation trends, and peak-hour congestion, ensuring effective monitoring and strategic interventions.
Traffic Monitoring Camera System (TMCS)		A fixed or PTZ (pan-tilt-zoom) camera-based surveillance system deployed along the highway corridor to provide continuous visual monitoring of traffic conditions. TMCS facilitates real-time observation, aids in incident verification, supports law enforcement, and enhances highway safety through situational awareness.
Variable Message Sign (VMS)		Shall mean electronic display boards installed along highways and urban roads to convey real-time information to road users. The VMS shall be capable of displaying variable text or graphical messages related to traffic conditions, safety advisories, incident alerts, lane closures, speed limits, and emergency notifications. The Contractor shall integrate the VMS with the ATMS control center

Technical Term	Description
	to enable remote operation, automated content scheduling, and real-time data-driven message updates. The VMS shall conform to relevant Indian and international standards including IRC specifications and guidelines prescribed by MoRTH. It shall ensure high visibility under all weather and lighting conditions and comply with prescribed norms for luminance, font legibility, character height, refresh rate, and energy efficiency.
Vehicle Actuated Speed Display (VASD)	Shall mean a speed awareness system comprising radar-based sensors and a digital display unit installed along the highway or road segment to detect and display the real-time speed of approaching vehicles. The system alerts drivers by visually indicating whether they are within permissible speed limits and may include warning messages or flashing alerts for overspeeding. VASD is an advisory tool aimed at improving driver compliance and road safety; it does not perform enforcement functions. The Contractor shall ensure the installation is accurate, weatherproof, visible in all lighting conditions, and maintained regularly to function reliably as per the specifications of the contract.
Video Incident Detection and Enforcement System (VIDES)	shall refer to an AI-powered surveillance subsystem integrated within the Advanced Traffic Management System (ATMS), designed for automated detection, classification, and enforcement of traffic-related incidents and violations. Leveraging machine learning algorithms, deep learning models, and computer vision techniques, VIDES shall monitor live video feeds from field-deployed cameras to identify traffic anomalies such as accidents, stopped or stalled vehicles, pedestrian intrusion, overspeeding,

Technical Term	Description
	wrong-way driving, and lane violations. The system shall generate real-time alerts for the Traffic Control Centre (TCC) and, wherever applicable, interface with law enforcement systems for automated challan generation and response coordination. By enabling proactive monitoring and swift incident response, VIDES shall significantly enhance situational awareness, improve traffic safety, and support data-driven enforcement and planning initiatives under the overall ATMS framework.
Warranty Period	Shall mean the predefined duration after system commissioning during which the Contractor is obligated to rectify defects, malfunctions, or non-compliance issues at no additional cost to the Employer. The Warranty Period for ATMS shall cover hardware, software, network infrastructure, and integrated components, ensuring seamless performance without degradation. The Contractor shall provide technical support, firmware updates, and spare part replacements as per the agreed terms. Any failure to maintain system uptime within the Service Level Agreement (SLA) parameters shall lead to penalty deductions.

2.2 Interpretation

In this Agreement, unless the context otherwise requires:

1. **Headings** – The headings and sub-headings are for convenience only and shall not affect the interpretation of this Agreement.
2. **Singular & Plural** – Words denoting the singular shall include the plural and vice versa, where applicable.
3. **Gender** – Any reference to a gender shall include all genders.
4. **Reference to Documents** – Any reference to an Act, Rule, Regulation, or Policy shall include any amendments, modifications, or re-enactments thereof.

5. **Order of Precedence** – In case of any conflict between different documents forming part of the Agreement, the order of precedence shall be as defined in the Particular Conditions of Contract (PCC).
6. **Day & Time Interpretation** – Any reference to "days" shall mean calendar days unless stated otherwise. References to time shall be as per **Indian Standard Time (IST)**.
7. **Reference to Parties** – Any reference to a party includes its permitted assigns, successors, and legal representatives.
8. **Inclusive Terms** – The words "**include,**" "**includes,**" or "**including**" shall be deemed to be followed by "**without limitation.**"
9. **Currency & Units** – All monetary references shall be in **Indian Rupees (INR)** unless specified otherwise. All measurements shall be in **metric units** unless stated differently.

2.3 Governing Law & Jurisdiction

This Agreement shall be governed by, and construed in accordance with, the laws of India. The parties hereby agree that any disputes, claims, or controversies arising out of or in connection with this Agreement, including its validity, interpretation, enforcement, or performance, shall be subject to the exclusive jurisdiction of the courts in New Delhi, India.

The parties consent to the jurisdiction of the courts of New Delhi and waive any objections based on venue or forum non conveniens. All legal proceedings under this Agreement shall be conducted in the English language.

2.4 Language of the Contract

This Agreement, along with all communications, notices, documentation, and legal proceedings arising from or related to it, shall be in **English**. In case of any translation of this Agreement into another language, the **English version** shall prevail and be deemed authoritative for interpretation and enforcement.

2.5 Communications & Notices

All communications, notices, or requests required or permitted under this Agreement shall be in **writing** and shall be deemed duly given when:

- (i) **Delivered in person** with acknowledgment of receipt;
- (ii) **Sent by registered post or speed post** with acknowledgment due;
- (iii) **Sent via email** to the designated official email addresses of the Parties, provided that a confirmation of receipt is obtained; or
- (iv) **Dispatched through an internationally recognized courier service** with proof of delivery.

Each Party shall notify the other in writing of any change in its communication details. Unless otherwise specified, all notices shall be addressed to the official contact details provided in the Agreement or as subsequently updated in writing by the concerned Party.

Failure to acknowledge or respond to a notice shall not affect its validity if duly served as per the above provisions.

2.6 Priority of Documents

In the event of any inconsistency, contradiction, or conflict between different provisions of this Agreement, the following order of precedence shall apply, with the document appearing first taking precedence over those listed subsequently:

- (i) **The Contract Agreement, including all amendments and addenda thereto, if any.**
- (ii) **The Particular Conditions of Contract (PCC),** if applicable.
- (iii) **This General Conditions of Contract (GCC).**
- (iv) **Any Corrigenda, Clarifications, or Pre-bid Responses issued by the Employer.**
- (v) **The Technical Specifications, Functional Requirements, and Drawings.**
- (vi) **The Employer's Request for Proposal (RFP) and its Annexures.**

(vii) **The Contractor's Technical and Financial Proposal, to the extent accepted by the Employer.**

(viii) **Any other document mutually agreed upon in writing between the Employer and the Contractor.**

In case of a conflict between a **specific provision** and a **general provision** within the same document, the provision that is **more specific and relevant** to the subject matter shall prevail.

In case of any discrepancy between:

(i) **Numerical and word-based values**, the value expressed in **words shall prevail**.

(ii) **Drawings and technical specifications**, the **technical specifications shall prevail**, unless otherwise explicitly stated.

(iii) **Standard industry practice and contractual terms**, the **contractual terms shall prevail**, unless they contravene applicable laws.

The Employer's decision regarding the interpretation and applicability of conflicting provisions shall be **final and binding**, subject to the Dispute Resolution Mechanism outlined in this Agreement.

3 Scope of Contract

3.1 Description of Work

The Contractor (System Integrator) shall undertake the design, supply, installation, testing, commissioning, operation, and maintenance of the Advanced Traffic Management System (ATMS) in accordance with the terms and conditions set forth in this Agreement.

The Contractor shall ensure the seamless integration of ATMS components, including but not limited to sensors, cameras, controllers, software applications, and network infrastructure, to achieve optimal system functionality.

The work shall be carried out in strict adherence to the Employer's requirements, technical specifications, and performance standards defined in this Agreement and its annexures.

The Contractor shall provide comprehensive documentation, training, and technical support to the Employer's personnel for the effective operation and maintenance of the ATMS.

3.2 Obligations of the Contractor (System Integrator)

The Contractor shall be responsible for the **end-to-end implementation, operation, and maintenance** of the ATMS in accordance with the terms of this Agreement. The Contractor's obligations include, but are not limited to, the following:

3.2.1 General Responsibilities

- (i) Execute the scope of work **diligently, efficiently, and in a professional manner** using internationally recognized industry practices.
- (ii) Ensure **compliance with all applicable laws, regulations, and technical specifications**, including but not limited to NHAI & IHMCL Guidelines, MoRTH, IRC, ISO, and IEC standards.

- (iii) Maintain a **dedicated project team**, including a qualified project manager, technical personnel, and operational staff, for the entire duration of the contract.
- (iv) Submit and adhere to a detailed project execution schedule, covering all key stages including submission and approval of the **Solution Design Document**, followed by design approval, procurement, installation, integration, testing, and commissioning milestones.

3.2.2 Design, Supply, and Installation Obligations

- (i) Conduct **detailed system design and engineering** in accordance with Employer-approved specifications.
- (ii) Procure, supply, install, and integrate all components of the ATMS, ensuring **compatibility and interoperability** with existing and future infrastructure.
- (iii) Conduct **Factory Acceptance Testing (FAT), Site Acceptance Testing (SAT), and final commissioning tests** to validate system performance before handover.
- (iv) Ensure all installed equipment and software are **certified and approved by relevant regulatory authorities** before deployment.

3.2.3 Project Execution, Approvals & Timelines

- (i) Submit design documents, method statements, and execution plans for **Employer's review and approval within [30] days** of contract signing.
- (ii) Obtain all necessary **statutory, environmental, and regulatory approvals** before commencing work.
- (iii) Maintain an **updated risk management and mitigation plan**, including contingency measures for project delays.
- (iv) Coordinate with the Employer's representatives for any approvals, with a **maximum response time of [15] days** per submission cycle.

3.2.4 Operations, Maintenance & Performance Compliance

- (i) Provide a comprehensive maintenance program, including preventive and corrective maintenance of the ATMS for the entire contract duration.

- (ii) Ensure compliance with Service Level Agreements (SLA), including defined uptime, fault resolution timelines, and system availability requirements.
- (iii) Maintain a 24/7 helpdesk and support system for logging and addressing system faults.
- (iv) Conduct **regular software updates, patches, and cybersecurity assessments** to prevent vulnerabilities and data breaches.

3.2.5 Insurance & Risk Coverage

- (i) Maintain **comprehensive insurance coverage** for the entire duration of the contract, including:
 - a. **Contractor's All Risk (CAR) Insurance** covering equipment, materials, and work execution.
 - b. **Third-Party Liability Insurance** for damages to public property or injury to third parties.
 - c. **Workmen's Compensation Insurance** covering all employees and subcontractors.
 - d. **Cyber Liability Insurance** covering data breaches, hacking incidents, and system failures.
- (ii) Submit proof of insurance coverage to the Employer within **[30] days of contract signing**.
- (iii) Ensure that all subcontractors also carry appropriate insurance policies as per contract requirements.

3.2.6 Cybersecurity, Data Protection & Confidentiality

- (i) Implement **secure data storage, encryption, and access control measures** in compliance with ISO 27001 and relevant cybersecurity laws.
- (ii) Prevent unauthorized access, data leaks, or misuse of **sensitive government and traffic data**.
- (iii) Ensure compliance with the **Information Technology Act, 2000**, including amendments related to personal data protection.
- (iv) Maintain **strict confidentiality of project-related data**, preventing disclosure to unauthorized third parties.

3.2.7 Handover & Defect Liability Period

- (i) Provide **as-built drawings, operation manuals, and system documentation** upon project completion.
- (ii) Ensure a **defect liability period of [12] months post commissioning of the System**, during which any system failure shall be rectified by the Contractor at no additional cost.
- (iii) Conduct training programs for the Employer's personnel on **system operations, troubleshooting, and maintenance**.

3.3 Obligations of the Employer

The Employer shall be responsible for facilitating project execution by ensuring timely approvals, payments, and overall project governance. The Employer's obligations include, but are not limited to, the following:

3.3.1 Project Approvals & Facilitation

- (i) Provide the Contractor with **necessary site access, work permits, and right-of-way clearances** within **[21] days** of contract signing.
- (ii) Review and approve all technical submissions, design documents, and method statements within **[14] days** from the date of submission.
- (iii) Ensure timely coordination with government agencies for regulatory clearances and compliance-related approvals.
- (iv) Facilitate access to **existing infrastructure and traffic data** required for system integration.

3.3.2 Financial & Payment Obligations

- (i) Ensure **timely release of payments** as per the agreed payment milestones upon certification of work completion.
- (ii) Process all **invoices within [45] days** of submission, subject to satisfactory verification of work.

- (iii) Address payment disputes through a structured dispute resolution mechanism without causing undue delays.

3.3.3 Safety & Security Compliance

- (i) Provide necessary support for implementing **safety measures and traffic management plans** during installation and maintenance activities.
- (ii) Ensure that **emergency response teams and security personnel** are available at project sites when needed.

3.3.4 Employer's Responsibilities for System Operations

- (i) Designate an authorized representative to coordinate with the Contractor and ensure project compliance.
- (ii) Ensure that Employer personnel handling the ATMS are adequately trained in its **operation, troubleshooting, and security protocols**.
- (iii) Provide necessary resources for **long-term system sustainability**, including funds for future upgrades and expansions.

3.3.5 Change Management & Contract Amendments

- (i) Any modifications, additional work requirements, or change requests shall be mutually agreed upon and formalized through a **Contract Amendment Agreement**.
- (ii) In case of legal or regulatory changes affecting system functionality, the Employer shall engage with the Contractor to ensure compliance within **[14] days**.

3.4 Subcontracting & Third-Party Vendors

3.4.1 General Provisions on Subcontracting

- (i) The Contractor shall not subcontract the whole of the Works. The Contractor may engage subcontractors for specific parts of the Works, provided that:

- a. The **subcontracted scope does not include any critical system integration, cybersecurity, or compliance-related functions**, unless explicitly approved by the Employer.
 - b. The Contractor shall remain **solely responsible and liable** for the performance of all obligations under this Agreement, whether carried out by itself or by its subcontractors.
 - c. The Contractor shall ensure that all subcontractors comply with the terms and conditions of this Agreement, including applicable laws, industry standards, and contractual obligations.
- (ii) The engagement of a subcontractor shall not establish any contractual relationship between the Employer and the subcontractor, and the Employer shall not be responsible for any claims, liabilities, or obligations of the subcontractor.

3.4.2 Prior Approval & Employer's Right to Reject

- (i) The Contractor shall submit to the Employer, for prior written approval, a **detailed list of proposed subcontractors**, including:
 - a. The **scope of work** to be assigned to each subcontractor.
 - b. The **qualifications, past experience, and financial stability** of the subcontractor.
 - c. Copies of **valid statutory licenses, certifications, and insurance policies** of the subcontractor.
- (ii) The Employer shall have the right to **accept or reject** any subcontractor within **[14] days** of receiving the Contractor's submission. The Employer may reject any subcontractor based on **non-compliance, inadequate experience, or national security concerns**.
- (iii) If the Employer rejects a subcontractor, the Contractor shall propose an alternate subcontractor within **[5] days**, without affecting the project timeline.

3.4.3 Contractor's Responsibilities for Subcontractors

- (i) The Contractor shall be responsible for ensuring that all subcontractors:

- a. Perform their obligations in **compliance with the Agreement, MoRTH specifications, and applicable laws.**
 - b. Maintain **all required statutory approvals, insurances, and safety compliances** throughout the subcontract period.
 - c. Follow industry best practices in **workmanship, quality control, and cybersecurity measures.**
- (ii) The Contractor shall include **back-to-back contractual clauses** in all subcontracts to ensure that subcontractors:
 - a. **Indemnify and hold harmless** the Employer against any claims, damages, or losses arising from subcontracted work.
 - b. Adhere to **confidentiality and data protection** provisions, preventing unauthorized access or data breaches.
 - c. Comply with **workplace safety, labor laws, and environmental regulations**, ensuring ethical labor practices.
- (iii) The Contractor shall be liable for all **costs, damages, or penalties** arising due to non-performance or non-compliance of any subcontractor.

3.4.4 Restrictions on Subcontracting Core Work & System Security

- (i) The following **core works and critical operations** shall not be subcontracted under any circumstances:
 - a. **System design, software development, system integration, cybersecurity, and encryption management.**
 - b. **Performance testing, FAT, SAT, and final commissioning activities.**
 - c. **Any work related to regulatory approvals, statutory compliance, or safety certifications.**
- (ii) The Employer reserves the right to **terminate any subcontractor's engagement** if it determines that the subcontractor's performance jeopardizes project security, national interests, or system integrity.

3.4.5 Third-Party Vendors & Supply Chain Management

- (i) The Contractor may procure materials, equipment, or software from third-party vendors, provided that:

- a. All **hardware, software, and components** meet the required specifications and comply with **ISO, IEC, and MoRTH standards**.
- b. All suppliers provide valid **warranties, test certificates, and compliance declarations** for delivered goods.
- c. The Contractor shall conduct **due diligence, background checks, and security assessments** before engaging third-party vendors.
- (ii) The Employer reserves the right to **audit and verify** the compliance of third-party vendors supplying equipment or services for the project.
- (iii) The Contractor shall be liable for any defects, delays, or failures in equipment or services supplied by third-party vendors and shall ensure **timely rectifications or replacements** at its own cost.

3.4.6 Indemnity & Liability for Subcontractors & Vendors

- (i) The Contractor shall fully **indemnify, defend, and hold harmless** the Employer against any claims, liabilities, losses, or damages arising from:
 - a. Any act, omission, negligence, or breach of contract by a subcontractor or third-party vendor.
 - b. Any defect, malfunction, or failure of subcontracted works, supplied equipment, or software.
 - c. Any labor law violations, safety non-compliance, or environmental breaches by subcontractors.
- (ii) The Contractor shall bear full responsibility for resolving any disputes, claims, or litigation arising between the Contractor and its subcontractors or third-party vendors, **without impacting the Employer's rights or causing delays in project execution**.

3.4.7 Engagement of Nominated Subcontractors

- I. The Contractor may propose to nominate one or more subcontractors (hereinafter referred to as "Nominated Subcontractors") to perform specific portions of the Works. The Contractor shall be obligated to engage such Nominated Subcontractors for undertaking the works indicated against them in its bid submission.
- II. Upon such engagement, the Contractor shall enter into an agreement with the Nominated Subcontractor, incorporating all relevant technical,

safety, quality, and compliance obligations of this Contract, on a back-to-back basis.

- III. Notwithstanding the nomination, the Contractor shall remain responsible for coordination, supervision, integration, and overall project delivery, ensuring that the activities of the Nominated Subcontractor do not delay or affect the performance of the Works.
- IV. Unless otherwise stated, all commercial, legal, and administrative obligations in relation to the Nominated Subcontractor, including payments, warranties, and insurances, shall be managed directly by the Contractor.
- V. Engagement of any Nominated Subcontractor shall not relieve the Contractor of its obligations with respect to workplace safety, site access, security protocols, and compliance coordination under this Contract.
- VI. In the event the Contractor fails to make due payments to the Nominated Subcontractor within the agreed timelines under the relevant subcontract agreement, the Employer shall have the right, but not the obligation, to pay such amounts directly to the Nominated Subcontractor by deducting the corresponding amount from sums otherwise payable to the Contractor under this Contract. The Contractor hereby expressly consents to such deduction and shall raise no objection thereto.

3.4.7.1 **Definition of "Nominated Subcontractor"**

Nominated Subcontractor Shall mean any third-party agency, supplier, or service provider specifically named or designated by the contractor to perform a defined portion of the Works under this Contract.

3.5 **Standards & Specifications**

3.5.1 General Compliance Requirements

- (i) The Contractor shall design, develop, install, test, integrate, commission, and maintain the **Advanced Traffic Management System (ATMS)** strictly in accordance with:

- a. The **specifications outlined in this Agreement** and its annexures.
 - b. NHAI/Policy Guidelines/ Standard Documents/2023, Policy Circular No.11.53/2023 dated 10th October 2023
 - c. The latest **MoRTH guidelines and Indian Road Congress (IRC) codes**.
 - d. The applicable **Bureau of Indian Standards (BIS), International Electrotechnical Commission (IEC), and International Organization for Standardization (ISO) standards**.
 - e. All **statutory, regulatory, cybersecurity, and safety requirements** mandated by the Government of India.
- (ii) In case of any conflict between applicable standards, codes, or guidelines, the most stringent and performance-oriented standard shall apply, subject to approval by the Employer. However, in the event of any deviation or inconsistency between such specifications and the terms of this Agreement, the provisions of this Agreement shall specifically prevail.

3.5.2 ATMS System Architecture & Functional Requirements

The Contractor shall design and implement a robust, modular, and scalable system architecture for the Advanced Traffic Management System (ATMS), ensuring seamless integration of all deployed components and readiness for future expansion, upgrades, and multi-agency collaboration.

- (i) The system shall adopt **open standards and non-proprietary protocols** to avoid vendor lock-in and to facilitate future upgradability, interoperability, and integration with third-party or government platforms.
- (ii) The architecture shall support **real-time acquisition, processing, storage, and dissemination** of multi-source data including traffic volumes, incidents, weather conditions, and video feeds, across all functional subsystems.
- (iii) The system shall ensure **end-to-end interoperability** among key subsystems including CCTV, ANPR, ATCC, VMS, weather and environmental sensors, and automated incident detection systems.
- (iv) The system shall comply with applicable **international ITS standards** such as ISO 21217 (ITS Station Reference Architecture), ISO 14813 (ITS System Architecture), and IEC 60870 (for telemetry and control systems), ensuring global compatibility and performance benchmarks.

- (v) The architecture shall enable **centralized monitoring** at the Command-and-Control Centre, while also supporting **edge-level decision-making** and **AI-enabled analytics** for traffic flow optimization and real-time incident response.
- (vi) The system shall be **integration-ready** with existing and proposed **MoRTH/NHAI/National Highway platforms**, including FASTag backend systems, Bharat Maps, National/Regional Command and Control Centres, and relevant State Police databases, using secure **open APIs**.
- (vii) The design shall incorporate **cybersecurity measures** such as role-based access control, secure communication, system logging, and encryption protocols, as further detailed under Clause 3.5.5.
- (viii) The system shall be scalable and flexible to accommodate **future technologies**, such as AI/ML-based pattern recognition, vehicle classification, edge analytics, and predictive traffic modeling.
- (ix) The system interfaces and dashboards shall support multilingual access, including **Hindi, English**, and other regional languages as directed by the Authority.

3.5.3 Subsystem Specifications & Technical Standards

- (i) The Advanced Traffic Management System (ATMS) shall consist of a modular and interoperable framework with the following key components and system-wide functionalities:

- a. ATMS Control Centre with ATMS Software Platform**

- A central hub responsible for the integration, real-time monitoring, control, reporting, analytics, and configuration of all field equipment and subsystems. The software platform shall support scalable architecture, web-based dashboards, alert management, and historical data analysis.

- b. Automatic Number Plate Recognition (ANPR) System**

- High-accuracy camera-based vehicle identification system using OCR for capturing license plates. Shall support blacklisted vehicle alerts, enforcement records, journey time analysis, and interface with state police/RTO databases.

- c. CCTV Surveillance System**

IP-based high-resolution fixed and PTZ cameras for comprehensive corridor surveillance, incident verification, and visual evidence recording.

d. Central Command and Control Centre (CCC)

A higher-order control node for centralized monitoring and coordination of multiple ATMS zones or corridors, supporting escalation protocols, jurisdictional coordination, and high-availability backups.

e. Communication Backbone

A unified digital communication infrastructure comprising both optical fiber and wireless networks ensuring secure, real-time, and redundant data transmission between field devices and control centres.

f. Optical Fiber Cable (OFC)-based Digital Communication System

The primary data transmission network linking all ATMS equipment, control centres, and command centres with high throughput, redundancy, and low-latency connectivity.

g. Power Backup and System Redundancy

Provision shall be made for UPS and renewable energy sources, as per the requirements specified in the RFP, across all field equipment and vital system locations to ensure uninterrupted operations. This shall include appropriate battery backup, solar power options where applicable, and diesel generator (DG) sets at critical control and data hubs. Additionally, hardware-level failover mechanisms and data redundancy protocols shall be implemented to maintain system uptime and resilience against power or equipment failures.

h. Traffic Monitoring Camera System (TMCS)

A network of fixed and/or PTZ cameras strategically positioned for real-time traffic surveillance, congestion tracking, and visual assessment for operations and enforcement.

i. Variable Message Signboards (VMS)

Programmable LED displays placed roadside or overhead, capable of disseminating real-time traffic information, alerts, diversions, weather updates, and safety messages.

j. Vehicle Actuated Speed Display System (VASDS)

Radar-based displays that detect vehicle speeds and alert drivers when they exceed set speed thresholds, enhancing speed compliance and road safety.

k. Video-based Incident Detection and Enforcement System (VIDES)

AI-powered analytics system using CCTV/video feeds to automatically detect incidents such as stopped vehicles, wrong-way driving, overspeeding, and lane violations. Integrated with enforcement tools for evidence-based challaning.

3.5.4 System-Level Functional Requirements

a. Interoperability and Integration

All subsystems must operate cohesively using standardized protocols and data models, ensuring seamless communication and centralized monitoring across devices and vendors.

b. Open Standards and Protocols

The system shall adopt open, non-proprietary standards for software, communication, and data formats to ensure vendor-neutrality, modularity, and long-term upgradability.

c. Edge-Level Decision-Making and Centralized Control

Support for local/edge computing to allow decentralized response (e.g., speed alerts, local incident response), with central control centre capable of overriding or integrating edge decisions.

d. AI-Enabled Analytics

Incorporation of AI/ML capabilities within the ATMS software to perform predictive analytics, anomaly detection, traffic forecasting, and automatic violation recognition.

e. Future Integration and API Readiness

Provision for integrating with platforms such as FASTag backend, Bharat Maps, MoRTH/NHAI/NIC dashboards, State Police and RTO databases via open APIs, and compliant with relevant national ITS frameworks.

f. Standards Compliance

All systems, hardware, software, and network components shall comply with applicable national and international standards including ISO 21217, ISO 14813, IEC 60870, IRC codes, and BIS norms.

3.5.5 **Communication & Network Infrastructure**

The ATMS subsystems shall adhere to stringent performance parameters to ensure reliability, accuracy, responsiveness, and safety in real-time traffic management. The following minimum performance benchmarks shall apply to all installed equipment and software components:

3.5.6 **Availability and Uptime**

- (i) All field equipment and control centre systems shall maintain a minimum **[%age as indicated in SLA] uptime** on a monthly basis, excluding scheduled maintenance.
- (ii) Redundancy mechanisms must be deployed to eliminate single points of failure.

3.5.7 **Data Accuracy and Detection Rates**

- (i) **ANPR system** shall achieve a minimum **plate recognition accuracy of [%age as indicated in SLA]** under day/night and varied weather conditions.
- (ii) **VIDES and IDMS** shall detect **[%age as indicated in SLA]** of all defined incidents within 30 seconds of occurrence.
- (iii) **VASDS** shall detect overspeeding vehicles with an accuracy of not less than **[%age as indicated in SLA]**.

3.5.8 **Response Time**

- (i) All critical alerts (e.g., incidents, violations, system failures) shall be generated and relayed to the control centre within **15 seconds** of detection.
- (ii) **VMS updates** to be triggered within **30 seconds** of command from ATMS Software or IDMS module.

3.5.9 **Communication Latency**

- (i) Data transmission latency across the communication backbone including OFC shall not exceed **150 milliseconds** for critical real-time systems like CCTV, ANPR, and VMS.

3.5.10 **System Scalability**

- (i) All software systems shall support horizontal and vertical scalability to accommodate future traffic growth, equipment additions, and software module upgrades without major re-engineering.

3.5.11 **Environmental Performance**

- (i) All field equipment shall function within a temperature range as specified in the technical specification of respective equipment, and shall be IP66-compliant for weather and dust resistance.

3.5.12 **Power Backup**

- (i) All critical field devices and control room systems shall be provided with a minimum of 4 hours of UPS backup, along with generator backup at key control locations, **as per the functional requirements prescribed in the RFP**. The power backup design shall ensure uninterrupted system performance during outages and shall be scalable to accommodate future expansion, if required under the project scope.

3.5.13 **Cybersecurity and Data Integrity**

- (i) All subsystems must implement **AES-256 encryption**, secure login credentials, firewall protections, and audit trails.
- (ii) Systems shall be compliant with **CERT-In guidelines** for government infrastructure.

3.5.14 **Interoperability and Integration**

- (i) All subsystems must demonstrate plug-and-play integration capabilities with ATMS Software using **open APIs** and **standard communication protocols** (e.g., NTCIP, HTTPS, MQTT).

3.5.15 **Maintenance and Diagnostics**

- (i) Field devices shall support remote diagnostics, health monitoring, and firmware updates.

- (ii) Preventive maintenance schedules shall be adhered to as per OEM guidelines and logged within the ATMS software.

3.5.16 Compliance and Certification

- (i) All components must comply with applicable **MoRTH, IRC, BIS, and international standards** (ISO/IEC), and shall be certified by accredited agencies wherever required.

3.5.17 Cybersecurity & Data Protection

- (i) The Contractor shall ensure that **all ATMS components, data transmission, and storage systems** comply with:
 - a. **ISO/IEC 27001 & NIST Cybersecurity Framework** for IT security.
 - b. **GDPR & Indian IT Act, 2000** for data privacy and handling.
 - c. **Zero-trust architecture principles**, including **multi-factor authentication and role-based access control**.
- (ii) The system shall be protected against **Denial-of-Service (DoS) attacks, data breaches, and malware intrusions**, with **continuous security monitoring and automated alerts**.

3.5.18 Testing, Commissioning & Performance Standards

- (i) The Contractor shall conduct **Factory Acceptance Tests (FAT), Installation Acceptance test, System Acceptance Tests (SAT), and System Integration Tests (SIT)** in accordance with:
 - a. **ISO 2859 (Acceptance Sampling)** for quality control.
 - b. **IEC 61968 (System Integration & Testing of IT Systems)**.
 - c. **Minimum operational uptime of 99.9% over a rolling 12-month period**.
- (ii) All test reports shall be submitted to the Employer for approval, and the system shall not be deemed operational until successful completion of **User Acceptance Testing (UAT)**.

3.5.19 Defect Liability, Warranty & Maintenance Standards

- (i) The Contractor shall provide a **comprehensive warranty for a period of [5] years**, covering:
 - a. **All ATMS hardware and software components** against defects and malfunctions.
 - b. **Software updates, bug fixes, and security patches**, ensuring continued compliance with evolving regulations.
 - c. **Minimum Mean Time Between Failures (MTBF)** shall be as per the **technical specifications of the respective component**, as specified in the RFP or approved by the Employer. All hardware components must comply with the declared MTBF values to ensure long-term reliability and system performance.
- (ii) The Contractor shall maintain a **24x7 Helpdesk and Remote Monitoring System for reporting, tracking, and managing all system-related issues**. The service levels for response time, resolution time, categorization of issues, and associated penalties or remedies shall be as defined in the Service Level Agreements (SLAs) **prescribed in the RFP** and its subsequent amendments, if any.

3.5.20 Modifications & Upgrades

- (i) The Employer reserves the right to require system **modifications, upgrades, or enhancements** due to **technological advancements, regulatory changes, or project requirements**.
- (ii) The Contractor shall ensure that the ATMS remains **scalable and adaptable**, supporting future **integration with AI-based traffic management, 5G communication, and smart city initiatives**.

3.6 Compliance with Regulatory & Statutory Requirements

3.6.1 General Compliance

The System Integrator (Contractor) shall ensure that all activities under this Agreement comply with applicable laws, regulations, rules, and guidelines prescribed by the Government of India, relevant statutory authorities, and

international best practices governing Advanced Traffic Management Systems (ATMS).

3.6.2 Industry Standards & Technical Compliance

The Contractor shall adhere to all mandatory technical standards and certifications, including but not limited to:

- (i) NHA/Policy Guidelines/ Standard Documents/2023, Policy Circular No.11.53/2023 dated 10th October 2023
- (ii) **MoRTH Guidelines & Specifications** – Compliance with the Ministry of Road Transport & Highways (MoRTH) standards applicable to ATMS components and infrastructure.
- (iii) **IRC Standards** – Adherence to Indian Roads Congress (IRC) specifications for highway technology deployment.
- (iv) **Bureau of Indian Standards (BIS)** – Ensuring materials and equipment conform to BIS specifications.
- (v) **ISO Certifications** – Compliance with ISO 9001 (Quality Management), ISO 27001 (Information Security), and ISO 14001 (Environmental Management) as applicable to ATMS.
- (vi) **OIML & NIST Standards** – If applicable, compliance with International Organization of Legal Metrology (OIML) and National Institute of Standards and Technology (NIST) requirements for sensors and monitoring equipment.
- (vii) **Cybersecurity Compliance** – Adherence to CERT-In (Indian Computer Emergency Response Team) and NCIIPC (National Critical Information Infrastructure Protection Centre) guidelines for IT and data security in ATMS.

3.6.3 Statutory Approvals & Clearances

- (i) The Contractor shall obtain all necessary approvals, permits, and clearances from relevant authorities, including but not limited to MoRTH, NHA, state governments, and municipal corporations, as required for system installation and operations.
- (ii) The Employer shall provide reasonable assistance, where necessary, in facilitating approvals; however, the primary responsibility for compliance remains with the Contractor.

- (iii) The Contractor shall ensure that any software, hardware, and data communication infrastructure procured and installed under this Contract is duly certified and licensed.

3.6.4 Labor & Employment Compliance

The Contractor shall strictly comply with the labor laws of India, including:

- (i) The Contract Labour (Regulation & Abolition) Act, 1970.
- (ii) The Employees' Provident Funds & Miscellaneous Provisions Act, 1952.
- (iii) The Minimum Wages Act, 1948.
- (iv) The Payment of Wages Act, 1936.
- (v) The Workmen's Compensation Act, 1923.
- (vi) The Building & Other Construction Workers (Regulation of Employment and Conditions of Service) Act, 1996.

The Contractor shall ensure fair wages, safety compliance, and welfare measures for all deployed personnel.

3.6.5 Environmental & Safety Regulations

- (i) The Contractor shall adhere to the Environment Protection Act, 1986, and ensure that ATMS implementation does not cause environmental degradation.
- (ii) Workplace safety shall be ensured as per the Occupational Safety, Health and Working Conditions (OSH) Code, 2020, and relevant safety guidelines.
- (iii) The Contractor shall implement best practices for road safety, site security, and risk mitigation during installation, maintenance, and operation of ATMS.

3.6.6 Penalties for Non-Compliance

- (i) Any failure to comply with the regulatory and statutory requirements specified in this Agreement may lead to penalties, termination of the contract, or legal action as deemed necessary by the Employer.

- (ii) The Contractor shall indemnify the Employer against any liabilities, fines, or penalties arising due to non-compliance with applicable laws and standards.
-

4 Performance Security & Guarantees

4.1 Performance Security Deposit (PBG)

4.1.1 Definition and Purpose

The Performance Bank Guarantee (PBG) is an **unconditional and irrevocable financial security** furnished by the Contractor (System Integrator) to NHIT, securing the Contractor's obligations under the Contract, including the **performance of works, compliance with terms and conditions, and rectification of defects**. It serves as a safeguard to ensure the fulfillment of contractual commitments and is **not a penalty or a form of liability** but a financial instrument for risk mitigation.

4.1.2 Amount and Validity Period

The Contractor shall furnish a **PBG equivalent to 10% of the Total Contract Value** within the days as specified in RFP from the issuance of the Letter of Award (LoA). The PBG shall remain valid for a period of **five (5) years** from the Effective Date of the Contract, with an additional **six (6) months claim period**. If the contract is extended for any reason, the Contractor shall **extend the validity of the PBG** accordingly, ensuring that it remains valid until **six (6) months after the completion of all contractual obligations**.

4.1.3 Issuing Bank and Format

The PBG shall be issued by any **Nationalized or Scheduled Commercial Bank** approved by the Reserve Bank of India (RBI) and shall be in the format prescribed by NHIT. **Any deviation from the prescribed format shall require prior written approval from NHIT.**

4.1.4 Conditions for Invocation and Replenishment

NHIT shall have the absolute right to invoke and forfeit the PBG, in whole or in part, under the following circumstances:

- (i) **Non-Performance:** Failure of the Contractor to execute the works as per contractual requirements, including **delays, non-compliance with technical specifications, or failure to rectify defects.**
- (ii) **Breach of Contract:** Any **material breach of the contract, including violations of obligations, non-adherence to safety or quality standards, or failure to meet milestone targets,** that remains uncured within the stipulated notice period.
- (iii) **Failure to Renew PBG:** If the Contractor **fails to extend, renew, or replace the PBG** before its expiry or within the required extension period in case of a contract extension.
- (iv) **Outstanding Dues:** If the Contractor has **unpaid liabilities, penalties, liquidated damages, or any recoverable amounts due to NHIT,** and fails to settle the dues despite notice.
- (v) **Failure to Maintain Requisite Performance Levels:** If the Contractor's performance **falls below the minimum acceptable standards** as per the contract, leading to financial or operational risks for NHIT.

In the event of **partial or full invocation of the PBG**, the Contractor shall **replenish the PBG within fourteen (14) days** from the date of invocation, ensuring that the Performance Security remains valid for the entire contract duration plus six (6) months. Failure to replenish the PBG shall constitute a material breach, entitling NHIT to take further **remedial actions, including termination of the Contract.**

4.1.5 Release of PBG

The PBG shall be released only upon **successful completion of all contractual obligations**, including the completion of work, rectification of defects, and final acceptance of deliverables. The release shall be subject to:

- (i) No **pending claims, disputes, or outstanding liabilities** under the contract.
- (ii) No **breach of contract identified during the claim period**.
- (iii) A formal request by the Contractor for release, subject to NHIT's verification and confirmation of compliance.

The PBG shall be released within **six (6) months** of completion of all obligations, provided that there are no pending recoveries or unresolved issues.

4.1.6 **Governing Law and Jurisdiction**

The PBG shall be governed by and construed in accordance with the **laws of India**. Any disputes or claims related to the invocation, release, or enforcement of the PBG shall be subject to the **exclusive jurisdiction of the courts in New Delhi, India**.

4.1.7 **Miscellaneous Provisions**

- (i) The PBG shall remain **independent of any other security deposit** under this Agreement.
 - (ii) NHIT's **right to invoke the PBG shall be absolute**, and no prior consent from the Contractor shall be required.
 - (iii) Any modifications, amendments, or extensions to the PBG shall be made only with **NHIT's prior written approval**.
 - (iv) The Contractor shall ensure that any **renewal, replacement, or extension of the PBG is submitted at least thirty (30) days before its expiry**.
-

5 Project Implementation & Execution

The Contractor shall be responsible for the **end-to-end implementation, execution, and successful deployment of the Advanced Traffic Management System (ATMS)** as per the contract. The implementation shall be carried out in **a phased and structured manner**, ensuring adherence to the prescribed milestones, technical specifications, and performance requirements.

The Contractor shall ensure that all activities, including **system design, hardware and software deployment, integration, testing, commissioning, and knowledge transfer**, are executed in a manner that meets NHIT's operational and safety standards. The execution of the project shall be aligned with the approved **Project Implementation Plan**, and any deviations shall require NHIT's prior approval.

All work shall be carried out in compliance with applicable **MoRTH, IRC, BIS, and other relevant industry standards**, ensuring interoperability, reliability, and future scalability of the ATMS infrastructure.

Failure to meet the agreed timelines, performance benchmarks, or quality standards shall render the Contractor liable for **liquidated damages, performance penalties, or other contractual remedies** as deemed necessary by NHIT.

5.1 Project Milestones & Timelines

The Contractor shall strictly adhere to the **Project Milestones and Timelines** as specified in the **Request for Proposal (RFP)** and its amendments. These milestones define the structured phases of the **Advanced Traffic Management System (ATMS) implementation and its subsequent Operation & Maintenance (O&M) period**. Any deviation from the prescribed schedule shall be subject to contractual remedies, including **liquidated damages, penalties, or invocation of Performance Security**.

General Conditions for Compliance with Timelines & Milestones:

- 5.1.1 **Obligatory Adherence:** The milestones set forth in the RFP are **contractually binding**, and compliance with each stage shall be monitored and enforced.

- 5.1.2 **Delay Mitigation & Recovery Plan:** If at any stage the Contractor anticipates a delay, a **detailed recovery plan with corrective measures** shall be submitted to NHIT for approval, ensuring minimal impact on the overall schedule. NHIT reserves the right to **reject any unjustified delays** and impose penalties.
- 5.1.3 Performance Monitoring & Reporting:
- (i) The Contractor shall submit **monthly progress reports**, highlighting work completed, bottlenecks, and mitigation strategies.
 - (ii) NHIT may conduct **periodic inspections, audits, and progress reviews** to ensure milestone compliance.
- 5.1.4 **Risk Management & Dependencies:** The Contractor shall take **full responsibility** for coordinating with all stakeholders, obtaining necessary approvals, and ensuring a smooth workflow. **Delays due to third parties, approvals, or force majeure events shall not absolve the Contractor from its obligations.**
- 5.1.5 **Acceleration of Work:** If NHIT determines that the project is lagging, the Contractor shall deploy **additional resources, work in extended shifts, or adopt any reasonable acceleration measures** at its own cost to recover lost time.
- 5.1.6 **O&M Readiness:** Before the commencement of the O&M period, the Contractor must ensure:
- (i) **Successful completion of all testing & acceptance procedures**
 - (ii) **Deployment of necessary personnel & resources for O&M**
 - (iii) **Submission of documentation & knowledge transfer reports**
- Non-compliance with the agreed milestones and timelines shall **trigger contractual enforcement mechanisms**, including but not limited to penalties, deductions, invocation of Performance Security, or termination of the contract.

5.2 Deployment of Personnel & Resources

The Contractor shall be solely responsible for deploying all necessary **personnel, materials, tools, equipment, and machinery** required for the **successful execution, commissioning, and operation of the Advanced Traffic Management System (ATMS)** as per the contract. This obligation extends through both the **Implementation Phase** and the **Operation & Maintenance (O&M) Period**, ensuring seamless project execution and sustained performance throughout the contractual tenure.

General Conditions for Deployment:

5.2.1 Full Responsibility for Resource Deployment

- (i) The Contractor shall **arrange, mobilize, and maintain** all required resources at its own cost and in compliance with the agreed project schedule.
- (ii) Deployment shall be planned efficiently to prevent **delays, disruptions, or suboptimal performance**.

5.2.2 Minimum Manpower Requirement

- (i) NHIT may provide a **minimum manpower deployment schedule** for both Implementation and O&M phases, which the Contractor shall strictly adhere to.
- (ii) The Contractor shall ensure all personnel possess **relevant qualifications, certifications, and experience** required for their designated roles.

5.2.3 Workforce Readiness & Compliance

- (i) All personnel engaged by the Contractor shall **comply with applicable labor laws, health & safety regulations, and contractual obligations**.
- (ii) A competent **Project Manager/Team Lead** shall be designated as the single point of contact responsible for overall execution, coordination, and reporting.

5.2.4 Availability of Material & Equipment

- (i) All **hardware, software, and related infrastructure** shall be **procured, installed, and maintained** by the Contractor in accordance with industry standards and approved specifications.

- (ii) The Contractor shall ensure timely delivery and deployment of **critical components** to avoid project delays.

5.2.5 Operational Readiness during O&M Phase

- (i) Throughout the O&M period, the Contractor shall ensure uninterrupted availability of **qualified personnel, spare parts, maintenance tools, and software support** to sustain system performance.
- (ii) A **preventive maintenance plan** shall be followed, and emergency response teams shall be in place to address system failures or incidents within agreed response times.

5.2.6 Failure to Deploy Adequate Resources

- (i) Any failure by the Contractor to deploy the required manpower, material, or equipment **within stipulated timelines** shall be considered a **contractual default**.
- (ii) NHIT reserves the right to **impose penalties, withhold payments, recover costs incurred due to non-compliance, or terminate the contract** in cases of persistent lapses.

The Contractor shall ensure that all deployed resources meet the **highest industry standards, ensuring timely completion, system reliability, and operational efficiency** throughout the contract duration.

5.3 Testing, Commissioning & Go-Live

The Contractor shall be responsible for the **comprehensive Testing, Commissioning, and Go-Live** of the **Advanced Traffic Management System (ATMS)**, ensuring full functionality, interoperability, and compliance with contractual specifications. All activities shall be executed in accordance with the approved **System Design Report (SDR), industry best practices, and applicable standards**.

5.3.1 Factory Acceptance Test (FAT)

- (i) The Contractor shall conduct **Factory Acceptance Testing (FAT)** for all major ATMS components prior to shipment.

- (ii) FAT shall be performed at the manufacturer's facility in the presence of NHIT representatives (if required) and shall include functional, performance, and reliability tests.
- (iii) Only **approved and certified** equipment shall be dispatched to the project site.

5.3.2 Site Installation & Installation Acceptance Test (IAT)

- (i) Upon delivery, all ATMS equipment shall be installed, integrated, and configured in accordance with the **approved installation plan and standard operating procedures (SOPs)**.
- (ii) The **Installation Acceptance Test (IAT)** shall be conducted to verify the correctness of installation, connectivity, and basic functionality before proceeding to commissioning.
- (iii) The Contractor shall rectify any **non-conformities, defects, or deviations** before progressing to the next phase.

5.3.3 System Commissioning & Go-Live

- (i) The Contractor shall conduct a **comprehensive System Commissioning Test**, ensuring all ATMS features and functionalities are fully operational and aligned with project specifications.
- (ii) The **Go-Live phase** shall commence after successful commissioning, during which real-time operations shall be monitored for stability, reliability, and performance under actual traffic conditions.
- (iii) The Contractor shall provide **technical and operational support** during the initial Go-Live period to address any unexpected issues.

5.3.4 System Acceptance Test (SAT) & Final Handover

- (i) A **Site Acceptance Test (SAT)** shall be performed within **15 days of Go-Live** to verify end-to-end system performance, redundancy, cybersecurity compliance, and user acceptance criteria.
- (ii) NHIT shall conduct a final **acceptance audit** before issuing a **Completion Certificate** for the project.

- (iii) Any identified deficiencies shall be rectified within an agreed timeframe, failing which NHIT reserves the right to **impose penalties, withhold payments, or seek corrective actions at the Contractor's cost.**

The Contractor shall ensure **strict adherence to quality standards, timely completion of testing phases, and seamless transition to operational readiness**, delivering a fully functional and reliable ATMS.

5.4 Training & Knowledge Transfer

The Contractor shall be responsible for ensuring comprehensive training and knowledge transfer to the Employer's designated personnel for the effective operation, maintenance, and troubleshooting of the Advanced Traffic Management System (ATMS). This shall include but not be limited to system functionalities, hardware components, software applications, troubleshooting procedures, and preventive maintenance.

Training Scope and Objectives:

5.4.1 Training Phases:

- (i) **Pre-Go-Live Training:** Conducted before system commissioning to familiarize personnel with ATMS functionalities, configuration, and operational controls.
- (ii) **Post-Go-Live Training:** Conducted after system deployment to cover real-time operations, monitoring, reporting, and system optimization.
- (iii) **O&M Training:** Ensuring technical teams are well-versed in preventive and corrective maintenance for uninterrupted system performance.

5.4.2 Training Methodology:

- (i) Instructor-led classroom training, hands-on field training, and remote training sessions as required.
- (ii) Role-based training for operations staff, system administrators, and maintenance teams.
- (iii) Provision of detailed training manuals, user guides, and troubleshooting documentation.

5.4.3 **Training Deliverables:**

- (i) Training calendar, syllabus, and competency assessment framework.
- (ii) Training sessions conducted by OEM-certified trainers or experts with prior experience in ATMS.
- (iii) Systematic evaluation of trainees through assessments, practical exercises, and certifications.

5.4.4 **Knowledge Transfer & Documentation:**

- (i) The Contractor shall provide complete system documentation, including configuration details, standard operating procedures (SOPs), and emergency response guidelines.
- (ii) A comprehensive knowledge repository with FAQs, video tutorials, and maintenance checklists shall be maintained for future reference.

5.4.5 **Continuous Skill Development:**

- (i) Periodic refresher training sessions during the O&M period to accommodate system upgrades, technology enhancements, and personnel changes.
- (ii) On-demand technical support and supplementary training for new personnel as required by the Employer.

The Contractor shall ensure that all training and knowledge transfer activities comply with international best practices and industry standards, enabling the Employer's team to achieve self-sufficiency in managing ATMS operations effectively.

5.5 **Site Access & Work Permits**

The Contractor shall be responsible for **obtaining all necessary permits, approvals, and clearances** before commencing any work on-site, in strict compliance with the Employer's Permit-To-Work (PTW) system and applicable regulatory requirements. The site access and work execution shall be governed by stringent safety protocols to ensure smooth project implementation without disruption to existing highway operations.

5.5.1 Site Access & Security Clearance:

- (i) The Contractor shall ensure that all personnel, subcontractors, and vehicles involved in the project obtain prior approval for site access, in accordance with the security and operational protocols established by NHIT.
- (ii) Site access shall be subject to verification of identity, security screening, and adherence to safety and work zone regulations.
- (iii) The Contractor shall coordinate with NHIT for scheduled work activities and notify in advance of any required access to restricted or high-security areas.

5.5.2 Permit-to-Work (PTW) System Compliance:

- (i) The Contractor shall strictly adhere to NHIT's PTW system and shall obtain formal work permits before initiating any activity, including but not limited to excavation, lifting, erection, electrical work, system integration, and commissioning.
- (ii) No work shall commence without written authorization, ensuring all safety measures, risk assessments, and method statements are reviewed and approved by the Employer.
- (iii) Emergency works shall be carried out with expedited approvals, subject to immediate notification to NHIT and adherence to safety measures.

5.5.3 Work Execution & Safety Compliance:

- (i) Lifting and erection activities shall only be performed by competent operators, certified riggers, and trained signalmen, with mandatory pre-approval of the lifting plan.
- (ii) Electrical works shall strictly be carried out by licensed electricians in compliance with national and international electrical safety standards.
- (iii) The Contractor shall be solely responsible for ensuring that all deployed personnel are trained, competent, and medically fit for the assigned work activities.
- (iv) The Contractor shall install appropriate barricading, signage, and warning systems to safeguard workers, road users, and infrastructure during work execution.

5.5.4 Compliance & Penalties for Violation:

- (i) Any failure to comply with site access and permit requirements shall be treated as a contractual breach, subject to penalties, suspension of work, or removal of unauthorized personnel.
- (ii) The Contractor shall bear full responsibility for any delay, damage, or incident arising due to non-compliance with permit regulations.
- (iii) NHIT reserves the right to revoke access or impose additional conditions in case of repeated violations or safety breaches.

The Contractor shall ensure full compliance with these requirements, maintaining the highest standards of safety, operational discipline, and regulatory adherence throughout the contract duration.

5.6 Approval Process and Timeline Commitment

5.6.1 Approval Timeline Commitment

The Employer shall review and provide a decision on all approvals related to the Advanced Traffic Management System (ATMS) within **14 (fourteen) working days** from the date of complete submission of all relevant information and documents by the Contractor.

5.6.2 Clarifications and Adjustment of Approval Timeline

If the Employer requests additional clarifications or documents within the 14-day period, the Contractor shall submit the required clarifications promptly.

- (i) **If the clarifications are provided on or before the 9th day**, the Employer must still provide the approval within the original 14-day timeline, with no extension.
- (ii) **If the clarifications are provided on or after the 10th day**, the approval deadline shall be extended by the number of days remaining in the original

14-day period, ensuring the Employer has a minimum of **5 (five) working days** from the date of final submission to process the approval.

5.6.3 Checklist for Approval Requirements

To ensure transparency and prevent delays due to incomplete submissions, the Employer and Contractor shall **jointly prepare and finalize approval checklists within 21 (twenty-one) days** from the signing of the Contract. The checklists shall comprehensively outline the required documents, test reports, certifications, and any other relevant information necessary for approvals. These approvals shall include, but not be limited to:

- (i) System design and architecture approval
- (ii) Hardware & software specification approval
- (iii) Integration testing & certification
- (iv) Cybersecurity compliance clearance
- (v) Calibration and accuracy certification
- (vi) Final commissioning and go-live approval

5.6.4 Contractor's Submission Responsibility

The Contractor shall submit a **tentative schedule** for all required approvals, aligned with their installation sequence, ensuring timely submission of approval requests to avoid project delays.

5.6.5 Impact of Non-Compliance and Delays

- (i) **Delays attributable to the Contractor:** If the Contractor submits incomplete or incorrect information, the delay shall be solely the Contractor's responsibility and may impact the overall project schedule. No extension of time shall be granted for such delays.
- (ii) **Delays attributable to the Employer:** If the Employer fails to provide approvals within the committed timeline despite receiving all necessary information, and if such delay directly impacts the overall project progress with no reasonable mitigation measures available, the Contractor may be

entitled to an **extension of time**, subject to demonstrating the actual impact on the project schedule and approval by the Engineer/Employer.

6 Payment Terms & Invoicing

6.1 Contract Price & Currency

The total Contract Price shall be the firm and fixed amount quoted by the Contractor and accepted by the Employer, inclusive of all costs, duties, levies, and charges, except Goods and Services Tax (GST), which shall be payable as per the applicable statutory provisions. The Contract Price shall not be subject to escalation, except where expressly provided under this Contract.

All payments shall be made in **[Indian Rupees (INR)]**, and the Contractor shall bear any foreign exchange fluctuation risks. The Contractor shall ensure that invoices explicitly mention the Contract Price and applicable GST separately, in compliance with the prevailing taxation laws and in the format prescribed under the Goods and Services Tax Act and Rules.

The Contract Price shall be deemed to cover all costs necessary for the full and proper execution of the ATMS works, including but not limited to **software development, system integration, hardware procurement, licensing, installation, commissioning, maintenance, and warranty support**, along with adherence to cybersecurity, data protection, and system uptime requirements specified in this Contract.

6.2 Payment Schedule & Milestones

6.2.1 CAPEX Payments

Payments for Capital Expenditure (CAPEX) shall be made in accordance with the agreed contractual milestones, ensuring systematic and performance-linked disbursement. The payment milestones shall be structured to align with key project deliverables, including but not limited to **mobilization, design approval, equipment delivery, installation, commissioning, and final system acceptance**.

Mobilization Advance, where applicable, shall be disbursed against the submission of an irrevocable **Advance Bank Guarantee (ABG)** equivalent to the claimed amount. The ABG shall remain valid until the successful completion of the milestone linked to its release.

All CAPEX milestone payments shall be subject to verification of compliance with contractual requirements, submission of supporting documents, and certification by the Employer's representative. The Contractor shall ensure that all necessary approvals, acceptance reports, and test certifications are submitted along with invoices.

6.2.2 **OPEX Payments (Operations & Maintenance Phase)**

Payments for the Operation & Maintenance (O&M) phase shall be made in periodic **quarterly installments**, based on compliance with the agreed Service Level Agreements (SLAs). O&M payments shall commence only upon formal acceptance of the system by the Employer.

The Contractor shall submit invoices for O&M payments **post completion of each quarter**, along with necessary supporting documentation demonstrating adherence to uptime requirements, system availability, and other contractual performance indicators.

6.2.3 **General Payment Provisions**

- (i) **No Payment Without Supporting Documentation** – Payments shall only be processed upon submission of invoices along with the required supporting documents, including system acceptance reports, test certifications, and verification from the Employer.
- (ii) **Adjustments** – The Employer reserves the right to withhold or adjust payments for non-compliance, delays, or failure to meet SLA requirements, as per the provisions of this Contract.
- (iii) **Final Settlement** – The final payment under CAPEX and OPEX shall be subject to the successful closure of all punch points, completion of contractual obligations, and submission of a **no-dues certificate** from the Contractor.

6.3 Taxes, Duties & Statutory Levies

- 6.3.1 **Inclusive Pricing** – The Contract Price shall be deemed **inclusive of all applicable taxes, duties, levies, and charges**, except for **Goods and Services Tax (GST)**, which shall be payable separately as per the applicable laws. The Contractor shall ensure that all statutory payments, including but not limited to customs duties, excise duties, and local levies, are duly accounted for in the Contract Price.
- 6.3.2 **Goods and Services Tax (GST)** – GST shall be **charged separately on invoices**, in compliance with the prevailing GST laws. The Contractor shall provide a **valid tax invoice** meeting all statutory requirements for GST input tax credit purposes. The Employer shall pay GST as per the applicable rates at the time of invoicing.
- 6.3.3 **Withholding Tax & Deductions** – The Employer shall deduct **Tax Deducted at Source (TDS)** and any other applicable statutory deductions as per the prevailing laws. The Contractor shall be responsible for obtaining any tax exemption certificates, if applicable, and submitting them to the Employer before invoicing.
- 6.3.4 **Change in Law** – Any increase or decrease in statutory taxes, duties, or levies after the **Base Date** (as defined in the Contract) shall be adjusted accordingly, subject to the Contractor providing sufficient documentary evidence of such changes and their impact on the Contract Price.
- 6.3.5 **Compliance & Indemnity** – The Contractor shall comply with all tax regulations and statutory obligations applicable to the execution of this Contract. The Contractor shall indemnify the Employer against any liability, penalty, or claim

arising due to non-compliance with tax laws by the Contractor or its subcontractors.

6.4 Deductions & Withholdings

- 6.4.1 **Statutory Deductions** – The Employer shall deduct all applicable taxes, duties, and levies as required under Indian laws, including but not limited to **Tax Deducted at Source (TDS), Goods and Services Tax (GST) TDS, Labour Welfare Cess, and any other statutory deductions**. The Contractor shall be responsible for obtaining and providing the necessary exemption certificates, if applicable.
- 6.4.2 **Performance Security** – The Contractor shall maintain a **Performance Security (Bank Guarantee)** as per the agreed terms, which shall be retained until the successful completion of obligations, including defect liability and O&M phases, if applicable.
- 6.4.3 **Liquidated Damages & Penalties** – In case of delays, non-performance, or failure to meet contractual obligations, the Employer shall have the right to deduct Liquidated Damages (LD) and/or penalties as per the terms defined in the Contract. The deduction shall be applied to interim or final payments, as applicable.
- 6.4.4 **Other Withholdings** – The Employer reserves the right to withhold payments due to the Contractor in the following cases:
- (i) Non-submission of required documents, reports, or certifications.
 - (ii) Failure to comply with safety, quality, or contractual obligations.
 - (iii) Pending resolution of disputes, claims, or rectification of defects.
 - (iv) Any claims or liabilities arising from third-party obligations, including subcontractor dues.

- 6.4.5 **Final Settlement & Release of Payments** – All withheld amounts shall be released upon the **successful completion and final acceptance of works**, subject to clearance of all pending issues, claims, and statutory obligations, **after recovery of all penalties and damages**.

6.5 Late Payment & Interest Charges

- 6.5.1 **Timely Payment Obligation** – The Employer shall process and release payments to the Contractor in accordance with the agreed **Payment Schedule & Milestones** outlined in the Contract, subject to the submission of a complete and valid invoice along with all required supporting documents.
- 6.5.2 **Verification & Approval Process** – Payments shall be subject to verification, certification, and approval by the Employer. The processing period shall not exceed **45 days** from the date of submission of a **complete and valid invoice**. An invoice shall be considered valid only when it is backed by all the verified documents as per the list provided in **Clause 6.6**.
- 6.5.3 **Non-Applicability of Interest** – No interest shall be payable on:
- (i) **Performance Security, or withheld amounts** under contractual provisions.
 - (ii) **Deductions made towards penalties, liquidated damages, or statutory obligations.**
 - (iii) **Payments delayed due to disputes, non-compliance, or deficiencies in documentation.**

- 6.5.4 **Final Payment Adjustments** – Any applicable interest for late payments shall be settled along with the final bill, provided all contractual obligations are met, and there are no outstanding claims, liabilities, or disputes.

6.6 Submission of Documentation Along with Invoice

6.6.1 For Interim Payments (as per Payment Schedule)

To validate and process interim invoices, the Contractor must submit the following:

- (i) **System Implementation Documentation (For CAPEX Milestones):**
 - a. **Bill of Quantities (BoQ) & Work Progress Summary** – Indicating achieved milestones.
 - b. **Measurement & Inspection Reports** – Verified by the Client's authorized site representative.
 - c. **Material Test Reports & Quality Certifications** – For example: cables, cameras, servers, and other critical components.
 - d. **Factory Acceptance Test (FAT) Reports** – Signed by the Client or authorized third-party agency.
 - e. **Site Installation Proofs & Reports** – Signed by the Client's site representative.
 - f. **Integration Test Reports** – For example: Evidence of successful connection with e-Challan, VMS, surveillance, etc.
 - g. **System Acceptance Test (SAT) Reports** – Confirming operational readiness of ATMS equipment.
 - h. **OEM Warranty Certificates** – Valid from installation date.
 - i. **Insurance Compliance Proof** – Covering transit, storage, and installation period.
- (ii) **Statutory Compliance Documentation:**
 - a. **Wage Registers & Attendance Records** – For labor involved in installation & commissioning.

- b. **PF and ESI Deposit Receipts** – Proof of statutory compliance.
- c. **Labor Licenses & Workmen Compensation Policies** – Covering all engaged manpower.
- d. **GST-Compliant Tax Invoices** – Clearly breaking down applicable taxes.
- e. **Bank Guarantees (if applicable)** – Any ABG/PBG required for milestone-based payments.

6.6.2 For Final Bill (CAPEX Completion)

In addition to the above, the following must be submitted:

(i) System Completion Documentation:

- a. **Final Reconciliation Statement** – Equipment, quantities, and payments.
- b. **Final System Acceptance Test (SAT) Report** – With all punch points resolved.
- c. **Performance Validation Reports** – Confirming adherence to specifications.
- d. **Handover & Training Records** – Signed by the Client's designated authority.
- e. **As-Built Drawings & System Architecture Documentation** – Final, approved versions.
- f. **Deduction Summary** – Details of recoveries, advances, and penalties.

(ii) Statutory Compliance Documentation:

- a. **Acknowledgment of No Claims** – Signed declaration confirming no pending claims.
- b. **Final Insurance Clearance Certificate** – Covering all risk liabilities.
- c. **Safety & Environmental Compliance Reports** – Including any site safety incident reports.
- d. **NOCs from Authorities (if applicable)** – For regulatory or third-party approvals.

6.6.3 For Operations & Maintenance (O&M) Phase Payments

To validate and process invoices during the O&M phase, the Contractor must submit:

(i) O&M Performance Documentation:

- a. **SLA Adherence Reports** – Demonstrating compliance with uptime, response time, and resolution KPIs.
- b. **Preventive & Corrective Maintenance Reports** – Logs of all scheduled maintenance activities.
- c. **Incident & Fault Resolution Logs** – Detailing issues and rectifications performed.
- d. **Equipment Health Reports** – Covering all major hardware components.
- e. **Network & Data Backup Compliance Reports** – Ensuring system continuity and data security.
- f. **Cybersecurity & Data Compliance Reports** – Validating security measures per contract.
- g. **Insurance Renewal & Compliance Proofs** – Covering O&M period.

(ii) Financial & Statutory Documentation:

- a. **Quarterly Performance Invoices** – As per the agreed OPEX payment schedule.
- b. **Updated Manpower Deployment Records** – Including duty rosters for the O&M team.
- c. **GST-Compliant Tax Invoices** – Clearly mentioning service period and applicable taxes.
- d. **Wage Registers & Attendance Records** – For labor involved in Operation & Maintenance.
- e. **PF & ESI Compliance Proofs** – Covering deployed O&M workforce.

Failure to submit complete and accurate documentation **shall render the invoice invalid** and may delay processing. The Contractor is solely responsible for ensuring timely submission of all necessary documents.

7 Change Management & Variations

7.1 Changes in Scope & Additional Work

7.1.1 General Principles

- (i) The Contract is awarded on a **Lump Sum Turnkey (LSTK) basis**, and the Contractor shall be fully responsible for delivering a fully functional **Advanced Traffic Management System (ATMS)** in accordance with the contract specifications, irrespective of whether all individual components are explicitly listed in the **Bill of Quantities (BoQ)**.
- (ii) Any component, software, accessory, or ancillary system **required for achieving full functionality** and compliance with the technical specifications shall be deemed included in the Contractor's scope, and **no additional payment shall be made for such elements**.

7.1.2 Identification of Changes

- (i) A change in scope shall be recognized only if:
 - a. The Client formally **directs additional work** beyond the defined technical specifications.
 - b. The change is due to **new regulatory requirements** introduced after contract award.
 - c. The change is necessitated due to **force majeure events**, as per the Force Majeure Clause.
- (ii) Any modification, deletion, or enhancement beyond the originally defined scope shall **not be treated as a Variation** unless explicitly authorized by the Client.

7.1.3 Role of Bill of Quantities (BoQ) in Change Management

- (i) The **BoQ serves as a tracking and verification tool** for material supply and implementation but does not define or limit the Contractor's obligations under the Contract.

- (ii) If an additional requirement, such as extra cameras, sensors, or infrastructure, is formally **instructed by the Client**, it shall be paid at BoQ rates. If no BoQ rates exist, the payment shall be as per Clause **7.2 (Cost & Time Implications of Change)**.
- (iii) The Contractor shall **not execute any additional work** beyond the defined scope unless a written instruction is issued by the Client in accordance with Clause **7.3 (Procedure for Approval of Changes)**. Unauthorized work shall be at the Contractor's sole cost and risk.

7.1.4 Limitations & Exclusions

- (i) No cost adjustments shall be allowed for:
 - a. **Errors, omissions, or deficiencies in the Contractor's design or planning.**
 - b. Changes required due to the **Contractor's failure to comply with specifications, regulations, or standards.**
 - c. Modifications that enhance or optimize the system at the Contractor's discretion, unless approved by the Client.

7.1.5 Statutory & Regulatory Compliance

- (i) The Contractor shall ensure that any modifications required due to **statutory or regulatory changes** post-award are immediately notified to the Client. The implications of such changes shall be addressed as per Clause **7.2 (Cost & Time Implications of Change)**.
- (ii) The Contractor shall remain responsible for obtaining all necessary **approvals, clearances, and certifications** for any modified system components.

7.2 Cost & Time Implications of Change

General Principles

- (i) The Contract follows a **Lump Sum Turnkey (LSTK) model**, and the Contractor shall bear full responsibility for ensuring system completeness without additional cost implications, except where changes are expressly directed by the Client in accordance with Clause **7.1.2 (Identification of Changes)**.
- (ii) Any Variation affecting cost and/or time shall be **subject to the prior written approval** of the Client, and no claim for additional cost or time shall be entertained unless formally approved under Clause **7.3 (Procedure for Approval of Changes)**.

7.2.1 Eligibility for Cost & Time Adjustments

- (i) Additional cost or time extensions shall be considered **only if**:
 - a. The Client **formally instructs additional work** beyond the originally defined technical specifications.
 - b. The change is due to **regulatory amendments** enacted post-contract award.
 - c. The modification is necessitated due to **force majeure events** in accordance with the Force Majeure Clause.
 - d. The Client issues a written instruction to **accelerate work progress** beyond agreed timelines.
- (ii) No cost adjustments shall be permitted for:
 - a. **Errors, miscalculations, or deficiencies** in the Contractor's design, planning, or execution.
 - b. Non-compliance or delays arising from the Contractor's **failure to fulfill contractual obligations**.
 - c. Any voluntary modifications undertaken by the Contractor without prior written authorization.

7.2.2 Pricing of Approved Variations

- (i) Where a change has been **formally instructed** by the Client, the pricing for such Variation shall be determined as follows:

- a. If the work item exists in the **Bill of Quantities (BoQ)**, the rates specified in the BoQ shall apply.
- b. If the work item does not exist in the BoQ, the rate shall be derived based on:
 - a) Applicable **Schedule of Rates (SOR)**, if available.
 - b) Market-rate analysis, subject to Client's review and approval.
 - c) A **mutually agreed lump sum price**, where applicable.
- (ii) If the Client disputes the rate proposed by the Contractor, the Employer's determination shall prevail, and the Contractor shall proceed with the work without delay.

7.2.3 Time Extensions for Approved Variations

- (i) If an approved Variation **impacts the project schedule**, the Contractor may apply for an **extension of time (EOT)** in accordance with Clause **7.3 (Procedure for Approval of Changes)**.
- (ii) The Contractor must **demonstrate the criticality** of the delay through an updated project schedule reflecting:
 - a. The **impact of the Variation** on key milestones.
 - b. Efforts undertaken to mitigate delays through resource reallocation or work sequencing.
 - c. The revised completion timeline with supporting justification.
- (iii) The Client reserves the right to **reject an EOT request** if:
 - d. The delay is attributable to the Contractor's **inefficiency, inadequate resource allocation, or poor planning**.
 - e. The change does not critically impact the overall project timeline.
 - f. The Contractor fails to provide sufficient **substantiation and supporting documentation**.

7.2.4 Non-Compliance & Risk Allocation

- (i) The Contractor **shall not suspend work** or delay execution on the pretext of awaiting cost or time approvals. Any unauthorized suspension shall be deemed a **contractual default**, and penalties may apply.

- (ii) If the Contractor **executes a Variation without prior written approval**, such work shall be deemed to be **at the Contractor's own risk and cost**, and no additional payment shall be made.
- (iii) Any dispute regarding cost or time adjustments shall be **resolved as per the Dispute Resolution Clause** of the Contract.

7.3 Procedure for Approval of Changes

7.3.1 Change Identification & Initiation

- (i) Any potential change to the contract scope, whether initiated by the Client or proposed by the Contractor, shall be formally recorded as a **Change Request (CR)**.
- (ii) A CR may arise due to:
 - a. Client's formal instruction for **additional, omitted, or modified work**.
 - b. **Regulatory or statutory changes** requiring amendments to the project scope.
 - c. Necessary modifications for ensuring compliance with **performance requirements, safety standards, or technological updates**.
 - d. Unforeseen site conditions affecting **installation, integration, or operability of the ATMS system**.
 - e. Force majeure events impacting project execution.

7.3.2 Submission of Change Proposal

- (i) Upon identification of a change, the Contractor shall submit a **formal Change Proposal (CP)** within **seven (7) days** of notification, detailing:
 - a. A clear description of the proposed change.
 - b. Justification for the change, including references to contractual provisions.
 - c. Impact analysis on project **cost, timeline, risk, and performance**.
 - d. Supporting technical drawings, specifications, or calculations, if applicable.

- e. Revised project schedule with a mitigation plan, where required.
- (ii) If the change is initiated by the Client, the Contractor shall provide a **preliminary impact assessment** within **three (3) days** and a detailed CP within **seven (7) days**.

7.3.3 Review & Approval by the Client

- (i) The Client shall review the CP within **fourteen (14) days** of submission and may:
 - a. **Approve the Change** and issue a formal **Variation Order (VO)**.
 - b. **Reject the Change** if deemed unnecessary or unjustified.
 - c. **Request additional information** or modifications for further assessment.
- (ii) In case of rejection, the Contractor shall continue work as per the original contract scope **without any delay**.

7.3.4 Execution of Approved Changes

- (i) No Change shall be executed without a **formal written Variation Order (VO)** from the Client.
- (ii) Upon issuance of the VO, the Contractor shall:
 - a. Implement the approved change **without disruption** to overall project progress.
 - b. Update the project plan, BoQ, or as-built drawings as applicable.
 - c. Ensure compliance with all contractual requirements, including quality, safety, and performance standards.
- (iii) Any unauthorized change undertaken by the Contractor without written approval shall be at **its sole risk and cost**.

7.3.5 Dispute Resolution for Change Approvals

- (i) If a disagreement arises regarding the **necessity, pricing, or impact of a change**, the matter shall be resolved through:
 - a. **Negotiation between the Contractor and the Client's Representative.**
 - b. **Review by an independent technical committee, if required.**

- c. **Referral to dispute resolution mechanisms** as per the contract, if unresolved.
- (ii) The Contractor shall **not suspend or delay ongoing work** while a change request is under review or dispute.

7.4 Claims & Compensation for Changes

7.4.1 Entitlement for Compensation

- (i) The Contractor shall be entitled to additional **cost and/or time compensation** only if the approved change:
 - a. Requires additional work beyond the **defined contract scope** and technical specifications.
 - b. Is explicitly instructed by the Client through a **formal Variation Order (vo)**.
 - c. Is necessitated due to **changes in laws, regulations, or statutory requirements** after the Contract Date.
 - d. Results from a **Force Majeure event** as per Clause [X] (Force Majeure).
- (ii) No compensation shall be payable for:
 - a. Any change due to the **Contractor's design errors, omissions, or planning deficiencies**.
 - b. Changes necessary for **achieving contractual performance requirements**.
 - c. Work executed **without prior written approval** from the Client.

7.4.2 Claim Submission Process

- (i) The Contractor shall submit a **formal Change Compensation Claim (CCC)** within **seven (7) days** from the approval of the Variation Order, including:
 - a. Breakdown of additional cost elements, including **labour, material, equipment, and overheads**.
 - b. Supporting documents such as vendor quotations, invoices, or material rates.

- c. Justification for time extension, with an updated work schedule showing the impact.
- (ii) Any claim submitted after **seven (7) days** shall not be entertained unless explicitly allowed by the Client.

7.4.3 Evaluation & Approval

- (i) The Client shall review the CCC within **fourteen (14) days** and may:
 - a. **Approve the claim** and include it in the next payment cycle.
 - b. **Reject the claim** if deemed unjustified, excessive, or outside the contract scope.
 - c. **Request additional clarifications or supporting documents.**
- (ii) If a claim is disputed, the Contractor shall **continue execution without delay** while the matter is resolved as per Clause [X] (Dispute Resolution).

7.4.4 Compensation Mechanism

- (i) Approved cost claims shall be paid as per the **agreed milestone-based payment schedule**.
 - (ii) Approved time extension claims shall be incorporated into the **revised contract schedule**, without additional cost implications.
 - (iii) No advance payments shall be made for additional work unless otherwise agreed.
-

8 Performance, SLA & Penalties

8.1 Key Performance Indicators (KPIs)

8.1.1 Purpose and Applicability

This clause defines the **Key Performance Indicators (KPIs)** applicable to the **Advanced Traffic Management System (ATMS)** to ensure its **operational efficiency, reliability, and compliance** with the technical specifications. The Contractor shall meet these KPIs throughout the **Operations & Maintenance (O&M) period**, as stipulated in the contractual requirements.

The Contractor shall be responsible for maintaining the **ATMS performance as per NHAI standards, IHMCL Guidelines** and any **relevant international standards for Intelligent Transportation Systems (ITS)**, such as **ISO 14813, ISO 19091, and EN 13141**.

8.1.2 ATMS Key Performance Metrics

The Contractor shall adhere to all Key Performance Indicators (KPIs) and Service Level Agreements (SLAs) as defined in the RFP and its annexures. The performance parameters listed below are indicative of industry best practices and serve to clarify expectations. However, in the event of any discrepancy or conflict, the provisions of the RFP shall prevail.

(i) System Uptime & Availability

- a. The ATMS shall maintain a **minimum uptime as specified in the RFP** (or as specified in the technical specifications).
- b. Uptime shall be measured on a **24x7 basis**, with all system components (servers, communication networks, sensors, cameras, and software) included.
- c. Downtime exceeding the allowable limit shall be subject to penalties in accordance with the RFP provisions.

(ii) Incident Detection & Response Time

- a. **Incident Detection:** The system shall detect and log any incident (such as traffic congestion, accidents, or system failures) within **the timeframes mentioned in the RFP**.
- b. **Response Time:** The ATMS operator shall be able to take the first action (e.g., alerting traffic authorities, activating Variable Message Signs (VMS), or triggering alarms) **within the period defined in the RFP** of incident detection.

(iii) Data Accuracy & Integrity

- a. The ATMS shall provide **real-time, accurate, and error-free data** as per the accuracy thresholds prescribed in the RFP.
- b. Traffic flow, speed, and vehicle classification data shall comply with deviation limits as stated in the RFP.
- c. All event logs shall be securely stored and time-stamped to ensure traceability requirements of the RFP.

(iv) System Latency & Data Processing Speed

- a. Data processing and command execution latency for critical operations shall conform to the timelines specified in the RFP.
- b. Transmission time for non-critical data shall also adhere to the standards set out in the RFP.

(v) Integration & Interoperability

- a. The ATMS shall seamlessly **integrate with third-party systems** such as toll management, emergency response units, and law enforcement databases as per the integration framework and requirements in the RFP.
- b. Data exchange shall follow standards such as NHAI's ITS architecture and ISO 19091, wherever mandated.
- c. API-based integration shall be tested and validated as per RFP specifications.

(vi) Video Surveillance & Analytics Performance

- a. CCTV and ANPR (Automatic Number Plate Recognition) cameras shall meet operational uptime thresholds as mentioned in the RFP.
- b. ANPR accuracy in various lighting conditions and video analytics detection rates shall comply with performance levels set out in the RFP.

(vii) System Security & Cyber Resilience

- a. The ATMS shall comply with ISO 27001 and other cybersecurity standards specified in the RFP.
- b. Unauthorized access attempts shall be detected and blocked in accordance with prescribed response times.
- c. Regular vulnerability assessments and system hardening shall be carried out as per the frequency and scope outlined in the RFP.

8.1.3 Monitoring & Compliance Requirements

- (i) The Contractor shall deploy a **centralized monitoring system** to track ATMS performance in real time.
- (ii) All KPIs shall be measured and reported **monthly** to the Client, with logs available for independent verification.
- (iii) Any deviation from the agreed KPIs shall be subject to **corrective action plans**, and persistent violations shall lead to penalties as per Clause 8.4.
- (iv) The Client reserves the right to conduct **independent audits** to ensure KPI compliance.

8.2 Service Availability & Uptime Guarantees

8.2.1 System Availability Requirements

The Contractor shall ensure that the system remains operational with the minimum uptime levels as defined in the **Technical Conditions & Specifications**. The system availability shall be measured as per the prescribed methodology and computed over the specified reporting period.

In the event of system downtime beyond the permissible limits, the Contractor shall take immediate corrective actions to restore functionality and mitigate any operational impact, in accordance with the **Technical Conditions & Specifications and the contractual obligations**.

8.2.2 Exceptions & Exclusions

The following instances shall not be considered as downtime, provided they fall within the limits and conditions specified under the **Technical Conditions & Specifications**:

- (i) Scheduled maintenance or planned outages duly notified to the Client in advance.
- (ii) Downtime due to force majeure events as per contractual provisions.
- (iii) Service disruptions caused by external factors beyond the Contractor's reasonable control, subject to appropriate documentation and approvals.
- (iv) Any conditions explicitly exempted under the **Technical Conditions & Specifications**.

The Contractor shall maintain detailed records of all outages, including their causes and resolution timelines, and provide justification for any downtime exclusions claimed.

8.2.3 Measurement, Compliance & Reporting

System uptime shall be **monitored, measured, and reported in accordance with the Technical Conditions & Specifications**. Availability statistics shall be submitted to the Client at predefined intervals as per the agreed reporting framework.

Any deviation from the committed uptime levels shall be recorded and reported **as per the compliance framework defined in the Technical Conditions & Specifications** and contractual obligations.

The Client reserves the right to conduct independent audits or inspections to verify the availability and performance of the system **against the benchmarks set forth in the Technical Conditions & Specifications**.

Failure to meet the uptime commitments shall result in consequences as outlined under **Clause 8.4 (Failure to Meet SLAs & Penalties)**.

8.3 Monitoring & Reporting Requirements

8.3.1 Performance Monitoring

The Contractor shall implement a comprehensive **monitoring framework** to continuously track the performance and availability of the system as per the benchmarks defined in the **Technical Conditions & Specifications**. The monitoring mechanism shall be designed to detect faults, assess compliance with SLAs, and enable proactive issue resolution.

All system components, including software, hardware, and network infrastructure, shall be monitored in real time through an **Automated Monitoring System (AMS)** or an equivalent mechanism, as specified in the **Technical Conditions & Specifications**.

8.3.2 Reporting Obligations

The Contractor shall submit periodic reports on system performance, availability, and compliance at predefined intervals, as per the reporting structure outlined in the **Technical Conditions & Specifications**. The reports shall include, but not be limited to:

- (i) **System uptime and downtime records**, including root cause analysis (RCA) for any failures.
- (ii) **Incident reports**, detailing service disruptions, resolution times, and corrective measures taken.
- (iii) **SLA compliance reports**, highlighting adherence to contractual obligations.
- (iv) **Audit logs and system performance metrics**, in accordance with monitoring standards.
- (v) **Any deviations, breaches, or potential risks** impacting system availability and performance.

All reports shall be **submitted in the format prescribed in the Technical Conditions & Specifications** and shall be shared with the Client within the stipulated timelines.

8.3.3 Client Oversight & Independent Audits

The Client reserves the right to:

- (i) Conduct **independent audits** to verify the accuracy of the monitoring data and ensure compliance with the agreed SLAs.
- (ii) Perform **surprise inspections** or demand real-time access to system monitoring dashboards.
- (iii) Require the Contractor to furnish additional reports or evidence demonstrating adherence to uptime and performance commitments.

Any inconsistencies, underreporting, or discrepancies identified during audits shall be treated as a **material breach of contract** and may invite corrective measures, penalties, or other actions as per **Clause 8.4 (Failure to Meet SLAs & Penalties)**.

8.3.4 Data Retention & Access

The Contractor shall maintain **historical monitoring data, logs, and reports** for a minimum duration as stipulated in the **Technical Conditions & Specifications**. This data shall remain accessible to the Client upon request, and the Contractor shall ensure that it is stored in a **secure and tamper-proof manner** to maintain authenticity and reliability.

8.3.5 Escalation & Corrective Actions

In the event of recurring failures, deviations, or SLA breaches, the Contractor shall:

- (i) **Trigger an escalation mechanism** as per the provisions in the **Technical Conditions & Specifications**.
- (ii) **Initiate immediate corrective actions** to restore compliance within a stipulated timeframe.
- (iii) Submit a **Corrective Action Plan (CAP)** outlining preventive measures to avoid future occurrences.

Failure to adhere to the monitoring and reporting obligations may lead to **penalties, invocation of performance guarantees, or further contractual remedies** as per Clause **8.4 (Failure to Meet SLAs & Penalties)**.

8.4 Failure to Meet SLAs & Penalties

8.4.1 Applicability & Governance

The Contractor shall adhere to the Service Level Agreements (SLAs) as specified in the Technical Conditions & Specifications. Any failure to meet the agreed-upon performance levels shall attract penalties as defined in the relevant provisions of the RFP and Contract Specifications.

8.4.2 Identification & Reporting of Non-Compliance

- (i) All service level non-compliances, including system downtime, delayed response times, and failure to meet performance metrics, shall be recorded, reported, and monitored in accordance with the procedures outlined in the Technical Conditions & Specifications.
- (ii) The Client reserves the right to conduct **independent audits and inspections** to validate compliance and identify any breaches in SLAs.

8.4.3 Rectification Timelines & Corrective Actions

- (i) Upon identification of an SLA breach, the Contractor shall take **corrective actions** within the prescribed timeline as stipulated in the Technical Conditions & Specifications.
- (ii) Failure to rectify within the allowed grace period (if any) shall result in the imposition of penalties in accordance with Clause 8.5 (LD, SLA Penalties & Liability Caps).

8.4.4 Penalty Triggers & Escalation

- (i) Penalties shall be triggered **automatically** upon failure to meet committed SLAs and shall be **calculated as per the provisions specified in the Technical Conditions & Specifications**.

- (ii) Repeated breaches of the same SLA within a given timeframe shall be **subject to progressive penalties**, as per the escalation matrix outlined in the Technical Conditions.

8.4.5 Linkage with Other Contractual Provisions

- (i) The financial implications of SLA non-compliance, including applicable penalties, liquidated damages (LD), and cost recovery, shall be governed under Clause **8.5**.
- (ii) The Contractor shall take **proactive measures** to prevent SLA breaches by implementing necessary **mitigation strategies** in accordance with the **Technical Conditions & Specifications**. In case of **repeated or prolonged non-compliance**, the Client may require the Contractor to submit a **corrective action plan**, ensuring long-term resolution of performance deficiencies.
- (iii) In the event of persistent default, where SLA breaches occur continuously or beyond an **acceptable threshold**, the Client reserves the right to impose **additional penalties** or invoke **Liquidated Damages (LD)** as per Clause **8.6**. LD shall be applicable at a rate of **1% per week**, subject to the overall cap specified under Clause **8.5**.
- (iv) The methodology for **calculating the LD period over the five-year contract duration**, including the applicable recovery mechanism, shall be detailed in Clause **8.6 (Liquidated Damages for Delays)**.

8.5 Liquidated Damages (LD), SLA Penalties & Liability Cap

8.5.1 Scope and Applicability

This Clause outlines the mechanism for enforcement of Liquidated Damages (LD) and Service Level Agreement (SLA) Penalties under this Contract. LD shall apply to delays in execution and milestone completion, while SLA penalties shall apply to performance failures during the Operation & Maintenance (O&M) phase. This Clause also defines the applicable liability caps for each.

8.5.2 Liquidated Damages (LD)

- (i) Liquidated Damages shall be levied for delays attributable to the Contractor in achieving project milestones, including supply, installation, commissioning, or Go-Live of the ATMS System.
- (ii) The LD shall be imposed at the rate of **0.1%** of the Contract Value per week (or part thereof) of delay.
- (iii) The **maximum limit for LD shall be capped at 10% (ten percent)** of the **Contract Value per site**.
- (iv) The methodology for LD computation and delay determination shall be governed by Clause 8.6 of this Agreement.

8.5.3 SLA Penalties

- (i) SLA penalties shall be applicable during the O&M phase for failures in achieving system uptime, response time, resolution time, or any other performance-related metrics specified under the Technical Conditions and SLA requirements.
- (ii) SLA penalties shall be computed and applied as per the performance benchmarks, monitoring mechanisms, and penalty matrix detailed in the Technical Specifications.
- (iii) The **maximum SLA penalty shall be capped at 10% (ten percent)** of the **Contract Value per site**, independently of the LD cap.

8.5.4 Separation of LD and SLA Penalties

- (i) LD and SLA penalties are **mutually exclusive**, apply to **distinct contractual obligations**, and shall be **enforced independently**.
- (ii) The aggregate of LD and SLA penalties, when applied together, **may reach up to 20%** of the Contract Value per site, i.e., **LD capped at 10% + SLA capped at 10%**.
- (iii) Enforcing one shall not limit or waive the right to enforce the other.

8.5.5 Recovery of Direct Costs and Limitation of Liability

- (i) In addition to LD and SLA penalties, the Client reserves the right to recover direct financial losses or damages arising from the Contractor's failure or breach, as specified in the RFP or Technical Conditions.
- (ii) Unless arising from exclusions listed below, such recoveries shall be **subject to an overall liability cap of 10%** of the Contract Value per site.
- (iii) **Exclusions:** The liability cap shall not apply in cases of:
 - a. Willful misconduct, gross negligence, or fraud;
 - b. Third-party claims, statutory violations, or indemnity-related obligations.

8.5.6 Performance Bank Guarantee (PBG)

- (i) The Performance Bank Guarantee submitted by the Contractor shall serve as a financial security against LD, SLA penalties, and other contractual obligations.
- (ii) The PBG shall remain valid throughout the Contract duration and for six (6) months thereafter.
- (iii) If the PBG is invoked by the Client, the Contractor shall replenish it within fifteen (15) days.
- (iv) Failure to do so shall be deemed a material breach and may result in:
 - a. Withholding of further payments;
 - b. Levy of additional penalties;
 - c. Termination of the Contract.

8.5.7 Precedence Clause

In case of any conflict between the provisions of this Clause and other parts of this Agreement or annexed documents, this Clause shall prevail and be binding.

8.6 Liquidated Damages (LD) for Delays

8.6.1 General Provisions

- (i) The timely execution, integration, and operationalization of the Advanced Traffic Management System (ATMS), including design, supply, installation, testing, commissioning, and Operation & Maintenance (O&M), is critical for the Employer's network operations. Any delay or failure in meeting contractual obligations shall attract Liquidated Damages (LD) as a genuine pre-estimate of the losses incurred by the Employer.
- (ii) The imposition of LD shall be without prejudice to the Employer's right to recover actual damages, enforce other contractual remedies, or terminate the Contract in case of material breaches.

8.6.2 Triggers for Liquidated Damages

LDs shall be applicable in the following cases:

(i) Project Execution Delays

LDs shall be imposed for:

- a. Failure to meet key milestones as per the approved Work Schedule.
- b. Delays in delivery, installation, testing, or commissioning of ATMS components.
- c. Failure to achieve system integration and operational readiness within the agreed timeline.

(ii) Performance & Operational Deficiencies

LDs shall apply if the Contractor:

- a. Fails to meet uptime and performance requirements for ATMS as per contractual obligations.
- b. Fails to rectify faults or defects within the prescribed Defect Liability Period (DLP).
- c. Fails to ensure real-time data accuracy, system responsiveness, or network security.

(iii) Non-Compliance with Reporting & Documentation

LDs shall be applicable if the Contractor:

- a. Fails to submit required progress reports within the stipulated timeframe.
- b. Fails to maintain an updated Risk Management Plan.

- c. Fails to provide mandatory certifications, approvals, or compliance documents.

8.6.3 Rate of Liquidated Damages

- (i) The LD shall be calculated as a percentage of the Contract Value or milestone payment, as follows:
 - a. **For project execution delays:** 0.5% of the affected milestone value per week of delay, up to a maximum of **10% of the total Contract Value**.
 - b. **For operational and SLA breaches:** As per predefined service level penalties, deducted from operational payments.
 - c. **For repeated violations:** Incremental LDs may be applied at the discretion of the Employer.
- (ii) The total LD under this Contract shall not exceed **10% of the Contract Value**, unless otherwise specified.

8.6.4 Computation & Deduction of LDs

- (i) The Employer shall compute LDs based on:
 - a. Extent and duration of delay or deficiency.
 - b. Impact on system operations and public safety.
 - c. Financial loss incurred due to non-performance.
- (ii) LDs shall be deducted from:
 - a. Milestone-based payments.
 - b. Monthly/quarterly operational payments.
 - c. Performance Bank Guarantee (PBG), if necessary.
- (iii) The Employer shall notify the Contractor of delays or deficiencies before imposing LDs. The Contractor may be granted a one-time cure period of **15 days**, except in cases of severe impact on operations.
- (iv) Repeated failures may result in:
 - a. **Escalated penalties** beyond standard LDs.
 - b. **Contract termination** under Clause [Termination Clause Reference].
 - c. **Invocation of PBG** and blacklisting from future contracts.

8.6.5 Exemptions from Liquidated Damages

No LDs shall be imposed if delays or deficiencies are solely due to:

- (i) **Force Majeure events** (as per Clause [Force Majeure Clause Reference]).
- (ii) **Regulatory approvals** beyond the Contractor's control.
- (iii) **Written instructions from the Employer** requiring work suspension.

8.6.6 Non-Exclusivity of Liquidated Damages

The imposition of LDs shall not prevent the Employer from:

- (i) **Recovering actual damages** exceeding the LD cap.
 - (ii) **Pursuing additional legal remedies** under the Contract.
 - (iii) **Terminating the Contract** in case of persistent breaches.
-

9 Intellectual Property, Data & Cybersecurity

This clause establishes the ownership, confidentiality, cybersecurity, and data protection framework for the **Advanced Traffic Management System (ATMS)**. Given the sensitive nature of traffic monitoring, enforcement, and analytics, the Contractor shall ensure **strict compliance** with **IT security, intellectual property rights, and international data protection standards**, including **FIDIC guidelines, ISO 27001, IT Act 2000, and GDPR (where applicable)**.

9.1 Ownership of Software & Deliverables

- (i) The **ATMS software, algorithms, and related IT systems** developed or deployed by the Contractor shall remain **the Contractor's intellectual property**, except as otherwise provided in this contract.
- (ii) The **Employer shall have a perpetual, royalty-free, and non-exclusive license** to use, modify, and integrate the ATMS software for operational purposes within its network.
- (iii) The **Contractor shall provide the Employer with all necessary software documentation**, including APIs, manuals, and operational workflows.
- (iv) In case the Contractor **ceases operations, fails to provide contractual support, or breaches service obligations**, the Employer shall have the right to demand:
 - a. A **perpetual license** for continued operations.
 - b. A **full source code escrow mechanism**, activated upon non-performance.
- (v) All hardware and ATMS equipment procured and deployed under this contract shall be the property of the Employer. The Contractor shall act as the custodian of such assets throughout the contract duration and shall ensure that all equipment is handed over in proper working condition to the Employer upon contract closure.

9.2 Use of Proprietary & Open-Source Software

- (i) The Contractor shall disclose all **third-party software components, open-source libraries, and proprietary modules** used in ATMS.
- (ii) Any **open-source software must comply with global licensing norms (e.g., GPL, MIT, Apache License)**, ensuring that its use does not create licensing conflicts.
- (iii) The Employer shall have the right to **audit the software stack** to verify compliance with licensing and security standards.

9.3 Confidentiality & Non-Disclosure

- (i) The Contractor shall **not disclose, share, or exploit any confidential information** obtained under this contract, including:
 - a. Traffic data, surveillance footage, and enforcement logs.
 - b. System architecture, encryption keys, and operational workflows.
 - c. Any analytics, reports, or AI-based traffic predictions generated through ATMS.
- (ii) The Contractor shall ensure **its employees, consultants, and subcontractors adhere to this confidentiality clause** by signing non-disclosure agreements (NDAs).
- (iii) **Reverse engineering, decompilation, or unauthorized use of ATMS software or proprietary data is strictly prohibited.**

9.4 Data Protection & Privacy Compliance

- (i) The Contractor shall implement **robust data protection mechanisms** in compliance with:
 - a. **ISO 27001** – Information Security Management.
 - b. **IT Act 2000 (India) & GDPR (where applicable)** – Data Privacy & Security.
 - c. **CERT-IN Guidelines** – National cybersecurity regulations.
- (ii) All ATMS data, including vehicle tracking, enforcement records, and surveillance footage, shall be:
 - a. **Encrypted using AES-256 standards** during storage and transmission.

- b. **Stored securely for a minimum of 5 years**, with controlled access.
- c. **Protected against unauthorized access through Role-Based Access Control (RBAC) & Multi-Factor Authentication (MFA).**
- (iii) The Contractor shall not **sell, share, or process ATMS data for commercial purposes** unless explicitly permitted by the Employer.

9.5 Cybersecurity & Data Breach Handling

- (i) The Contractor shall implement a **multi-layered cybersecurity framework**, including:
 - a. **Firewalls, Intrusion Detection & Prevention Systems (IDPS), and AI-based threat monitoring.**
 - b. **Regular vulnerability assessments & penetration testing** to prevent cyberattacks.
 - c. **Geo-fencing & IP restrictions** to prevent unauthorized remote access.
- (ii) **In the event of a data breach or cyberattack**, the Contractor must:
 - a. **Notify the Employer within 24 hours** and provide an incident report.
 - b. **Rectify the breach within 48 hours** and submit a root-cause analysis report.
 - c. **Conduct forensic analysis & implement remedial measures** to prevent recurrence.
- (iii) **Financial penalties for cybersecurity failures:**
 - a. ₹10 lakh per data breach due to contractor negligence.
 - b. ₹2 lakh per day for failing to restore cybersecurity compliance within 7 days.
 - c. The Employer reserves the right to **terminate the contract or seek damages** for repeated violations.

9.6 Software Updates, Version Control & Audits

- (i) The Contractor shall ensure **structured software version control** and comply with:
 - a. **FIDIC guidelines on software documentation & maintenance.**

- b. **ISO 27001-compliant change management protocols.**
- (ii) The Employer **must approve all major software updates, patches, or security fixes** before deployment.
- (iii) The Employer reserves the right to **audit cybersecurity logs, system updates, and compliance reports annually.**

9.7 Compliance Monitoring & Reporting

- (i) The Contractor shall submit **monthly cybersecurity compliance reports**, covering:
 - a. Intrusion attempts and security mitigations.
 - b. Software patching & system update logs.
 - c. Data access logs & compliance audits.
 - (ii) The Employer reserves the right to **impose additional security requirements** in case of emerging threats or regulatory changes.
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10 Risk Allocation, Liabilities & Insurance

10.1 Indemnification by the Contractor

10.1.1 Scope of Indemnity

The Contractor shall indemnify, defend, and hold harmless the Employer, its officers, directors, employees, agents, and representatives (collectively, the “Indemnified Parties”) from and against any and all **claims, demands, actions, suits, proceedings, losses, damages, liabilities, costs, and expenses** (including but not limited to **reasonable legal fees, court costs, penalties, and fines**) that arise out of, relate to, or result from:

- (i) **Breach of Contract** – Any failure by the Contractor, its subcontractors, or personnel to perform its obligations under this Contract, including non-compliance with applicable laws, regulations, and contractual terms.
- (ii) **Negligence or Misconduct** – Any negligent act, willful misconduct, fraud, or misrepresentation by the Contractor, its employees, agents, or subcontractors in connection with the performance of the Contract.
- (iii) **Third-Party Claims** – Any claim brought by a third party, including but not limited to **bodily injury, death, or damage to property** caused by the Contractor’s acts or omissions.
- (iv) **Statutory and Legal Violations** – Any breach of applicable laws, including but not limited to labor laws, environmental laws, health and safety regulations, and taxation laws.
- (v) **Intellectual Property Infringement** – Any claim that the Contractor’s deliverables, processes, or equipment infringe upon any third party’s patent, copyright, trademark, trade secret, or other proprietary rights.
- (vi) **Environmental Damage** – Any contamination, pollution, or environmental damage arising from the Contractor’s activities, including improper handling, storage, disposal, or release of hazardous substances.

10.1.2 Restrictions on Settlement

The Contractor **shall not, under any circumstances**, enter into any settlement, compromise, or resolution of any claim, dispute, or legal proceeding **that affects, impacts, or imposes any liability, obligation, penalty, or reputational risk on the Employer**, without the **prior written consent of the Employer**.

- (i) If any claim or dispute arises in relation to the Contractor's work under this Contract, the Employer **shall have the sole discretion** to determine how the matter is handled, including whether to negotiate, litigate, or settle the claim.
- (ii) The Contractor **must notify the Employer immediately** upon becoming aware of any claim, demand, or legal action against it that relates to the Contract, and **shall provide full details, supporting documents, and a proposed course of action**.
- (iii) The Employer **reserves the right to reject** any proposed settlement if it is deemed **unfavorable, unreasonable, or potentially harmful** to the Employer.
- (iv) If the Contractor breaches this provision and enters into an unauthorized settlement, **such settlement shall be deemed null and void**, and the Contractor shall be fully liable for all consequences arising therefrom, including indemnifying the Employer for any resulting damages or losses.

10.1.3 Survival of Indemnity Obligations

The indemnification obligations under the Indemnity clause of this Agreement titled '**Indemnity**' shall survive the termination or completion of the Contract for a period of **five (5) years**, or as per applicable law, whichever is longer.

10.1.4 Employer's Right to Defend & Recover Costs

If any claim, demand, legal proceeding, or regulatory action is initiated against the Employer due to the Contractor's actions, omissions, negligence, or breach of this Contract:

- (i) The Employer **shall have the exclusive right, but not the obligation**, to assume full control of the defense, including selecting legal counsel, determining legal strategy, and negotiating settlements.

- (ii) The Contractor **shall cooperate in good faith**, providing all necessary documents, evidence, and assistance required for the defense.
- (iii) **All legal costs, attorney's fees, expert witness fees, and other litigation expenses** incurred by the Employer in defending such claims shall be fully reimbursed by the Contractor within **[30] days** of demand.
- (iv) If the Employer incurs any damages, penalties, or liabilities as a result of the Contractor's failure to defend or cooperate, **the Employer shall have the right to recover such amounts from the Contractor**, in addition to any other legal remedies available under the Contract or law.

10.1.5 Additional Remedies

The rights and remedies available under this Clause **shall be in addition to, and not in limitation of, any other rights or remedies** available under the Contract, at law, or in equity.

10.2 Insurance Requirements (Contractor's All Risk, Third Party, etc.)

10.2.1 General Insurance Obligations

The Contractor shall obtain and maintain comprehensive insurance coverage throughout the Contract duration, including the Implementation and O&M periods, to safeguard all project-related assets, personnel, and third parties. The insurance policies shall be issued by an IRDA-approved insurer and remain valid without cancellation or modification unless prior notice is given to the Client.

10.2.2 Insurance Coverage During Implementation Period

- (i) The Contractor shall maintain insurance for all material, equipment, and assets under its ownership and control until the commencement of the O&M period. The coverage shall protect against risks such as fire, theft, vandalism, power surges, network surges, lightning, floods, storms, natural disasters, Force Majeure events, and any other potential hazards.

- (ii) The Contractor shall be solely responsible for claiming insurance and replacing or repairing any damaged components, ensuring no disruption to project implementation.

10.2.3 Insurance Coverage During O&M Period

- (i) Upon successful completion of SAT, commissioning, and closure of all Punch Points, the insurance responsibility for TMS/ATMS equipment shall transfer to the Client. The Client shall ensure continued insurance coverage for the installed systems against risks such as fire, theft, vandalism, natural disasters, and Force Majeure events.
- (ii) Notwithstanding the above, the Contractor shall maintain professional liability insurance with a minimum coverage amount of INR [XX] crores/lakhs to cover risks arising from its personnel's actions, negligence, or operational failures throughout the O&M period.

10.2.4 Personnel & Third-Party Insurance

- (i) The Contractor shall provide insurance for all personnel engaged under this Contract, including employees, subcontractors, and laborers, in accordance with applicable labor laws. Coverage shall include, but not be limited to:
 - a. Employees' State Insurance (ESI) as per the Employees' State Insurance Act, 1948.
 - b. Workmen's Compensation Insurance as per the Workmen's Compensation Act, 1923.
 - c. Comprehensive medical, accident, and life insurance coverage for all personnel, covering injuries, accidents, or fatalities occurring on-site or in transit.
 - d. Employer's liability insurance covering wages, medical expenses, and compensation in case of an incident.
- (ii) If any claim is not covered by the insurance company, the Contractor shall be solely responsible for bearing all expenses, including medical costs, compensation, and legal liabilities.

10.2.5 Third-Party Liability & Claims Handling

- (i) The Contractor shall maintain third-party liability insurance to cover damages, injuries, or legal claims resulting from its operations, including:
 - a. Accidental death, bodily injury, or property damage to third parties.
 - b. Legal costs arising from claims due to negligence, defective workmanship, or failure to comply with statutory safety and environmental regulations.
- (ii) The Contractor shall indemnify and hold harmless the Client against any third-party claims or legal liabilities.
- (iii) The Contractor shall notify the Client within [X] days of any third-party claim and provide all necessary documentation, including police reports, accident reports, and insurance claim submissions. The Contractor shall coordinate directly with the insurer for claim resolution and update the Client on the status.

10.2.6 Insurance Documentation & Compliance

- (i) The Contractor shall submit proof of insurance policies covering materials, personnel, and third-party liabilities within 30 days of LOA issuance.
- (ii) If an insurance policy is not submitted within the stipulated timeframe or expires during the Contract period without renewal, a penalty of INR 10,000 per day shall be levied on the Contractor until compliance is achieved. If the non-compliance exceeds 30 days, the Client reserves the right to suspend work, withhold payments, or initiate legal proceedings as necessary.
- (iii) The Contractor shall ensure continuous compliance with all insurance obligations, with periodic updates provided to the Client.

10.2.7 Indemnification Against Losses & Damages

The Contractor shall indemnify the Client against any loss or damage to property, personnel, or third parties resulting from the Contractor's operations, negligence, or failure to meet insurance obligations. In case of any dispute related to insurance claims, the Contractor shall bear all legal costs unless the dispute arises due to the Client's action, in which case both parties shall resolve the issue through mutual discussion or arbitration as per the Contract.

10.3 Health, Safety & Environmental Compliance

10.3.1 General Obligations

The Contractor shall ensure full compliance with Health, Safety, and Environmental (HSE) regulations, implementing industry-best practices aligned with:

- (i) The Building and Other Construction Workers (Regulation of Employment and Conditions of Service) Act, 1996.
- (ii) The Environmental Protection Act, 1986, and related pollution control norms.
- (iii) The Occupational Safety, Health, and Working Conditions Code, 2020.
- (iv) MoRTH, IRC, and relevant ISO standards, including ISO 45001 (Occupational Health & Safety) and ISO 14001 (Environmental Management).

The Contractor shall be solely responsible for ensuring a **safe work environment** and minimizing risks to personnel, third parties, and surrounding infrastructure.

10.3.2 HSE Plan, Implementation & Audits

- (i) The Employer shall provide an approved HSE framework. The Contractor must submit a **detailed site-specific HSE Plan within 15 days** of the Commencement Date, covering:
 - a. Workplace risk assessment, hazard identification, and emergency response planning.
 - b. Environmental protection measures, including air, water, and waste management.
 - c. Induction training, toolbox talks, and mandatory PPE usage.
 - d. Compliance with the Permit-to-Work (PTW) system.
- (ii) **HSE Audits & Inspections:**
 - a. The Employer shall conduct both **scheduled and surprise audits** to verify compliance.
 - b. The Contractor must rectify audit findings within the stipulated time frame.

10.3.3 Mandatory Safety & Environmental Compliance

- (i) **Personal Protective Equipment (PPE):** Mandatory for all workers, including helmets, safety shoes, gloves, goggles, and high-visibility vests.
- (ii) **Work at Height:** Full-body harnesses with double lanyards and secure anchoring are compulsory.
- (iii) **Traffic & Site Safety:**
 - a. Barricades, warning signs, and reflective markings as per **IRC SP 55:2014**.
 - b. Deployment of traffic marshals, LED blinkers, and safety vehicles where applicable.
- (iv) **Electrical Works:** Only certified electricians shall conduct electrical activities, using insulated tools and industrial-grade safety measures.
- (v) **Lifting & Rigging:** Must be performed by trained personnel using **third-party-certified lifting tools and equipment**.
- (vi) **Excavation & HDD Works:** Proper barricading, underground utility mapping, and shoring as required.
- (vii) **Environmental Protection:** The Contractor shall ensure:
 - a. Dust suppression, noise control, and proper waste disposal.
 - b. Prevention of oil spills and hazardous material handling per regulatory norms.

10.3.4 Incident Reporting & Corrective Action

- (i) Any accident, near-miss, or environmental incident must be reported to the Employer **immediately**.
- (ii) A **Root Cause Analysis (RCA) report** must be submitted within **24 hours**, along with corrective measures to prevent recurrence.
- (iii) The Employer reserves the right to halt work in case of safety lapses.

10.3.5 Enforcement, Penalties & Liabilities

- (i) **Non-compliance penalties** shall apply for:
 - a. Failure to use PPE, improper barricading, or unsafe work practices.
 - b. Environmental violations, including improper waste disposal and pollution.
 - c. Non-submission of the HSE Plan or non-compliance with audit findings.

- (ii) Repeated violations may result in **work suspension or contract termination**.
 - (iii) The Contractor shall be fully liable for any injury, fatality, or environmental damage due to non-compliance, and the Employer reserves the right to **recover penalties from payments or the Performance Bank Guarantee (PBG)**.
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11 O&M & Lifecycle Management

11.1 Operation & Maintenance (O&M) Requirements

11.1.1 General Obligations

The Contractor shall be fully responsible for the Operation and Maintenance (O&M) of the entire system, ensuring its continuous functionality, reliability, and compliance with the performance standards stipulated under this Contract. The scope of O&M shall encompass all hardware, software, network infrastructure, field equipment, and associated facilities, including but not limited to surveillance systems, variable message signboards, emergency communication systems, and incident detection mechanisms.

The Contractor shall operate and maintain the system in a manner that ensures seamless service delivery, minimal downtime, and full compliance with the Service Level Requirements (SLRs) and Key Performance Indicators (KPIs) as defined in the Contract. Any failure to maintain the prescribed service levels shall attract penalties as per the Performance Deductions Schedule.

11.1.2 Performance and Availability Requirements

The Contractor shall ensure that all system components remain fully operational, with an uptime of not less than **[as specified in RFP]**, calculated on a monthly basis. Any breakdown or malfunction shall be rectified within the stipulated response and resolution time defined under the Performance Requirements. The Contractor shall:

- (i) Implement a **proactive maintenance regime** to prevent failures and minimize reactive maintenance.
- (ii) Maintain a dedicated **Network Operations Center (NOC)** and **Field Service Teams** to ensure real-time system monitoring and rapid fault resolution.
- (iii) Ensure that **Critical System Failures** are rectified within **four (4) hours**, and all non-critical faults are addressed within the timeframe specified under the Contract.

- (iv) Maintain a **24x7 helpdesk facility** for reporting faults, service requests, and real-time coordination.

11.1.3 Preventive and Corrective Maintenance

The Contractor shall undertake **preventive maintenance** at predefined intervals, ensuring that all system components are checked, serviced, calibrated, and updated in accordance with OEM recommendations. Preventive maintenance shall include but not be limited to:

- (i) **Routine system diagnostics, software updates, and firmware upgrades.**
- (ii) Inspection **and servicing of field equipment**, including cameras, sensors, VMS, emergency call boxes, and roadside controllers.
- (iii) **Network health checks and cybersecurity audits** to prevent unauthorized access and data breaches.

Corrective maintenance shall be carried out **immediately upon detection of any malfunction**, with the Contractor responsible for deploying trained personnel and ensuring the restoration of services within the agreed response time.

11.1.4 Resource Deployment and Key Personnel

The Contractor shall deploy resources as per the minimum requirements specified in the RFP. Any specific qualification, experience, deployment schedule, or manpower number prescribed in the RFP shall override the indicative roles mentioned herein. The Contractor shall ensure full compliance with staffing norms, shift deployment, and key personnel availability as per the functional and operational requirements of the project.

These role definitions are included to aid interpretation, clarify expectations, and ensure consistent contract management throughout the project lifecycle.

- (i) **O&M Manager** – A technically qualified professional responsible for overall system operations and contractual compliance.
- (ii) **IT & Network Engineers** – Responsible for system monitoring, troubleshooting, and cybersecurity compliance.

(iii) **Field Maintenance Technicians** – Deployed strategically to ensure swift rectification of faults.

(iv) **Traffic Operations & Incident Management Team** – Responsible for real-time monitoring and coordination with enforcement agencies.

The Contractor shall maintain an **Emergency Response Team (ERT)** available round-the-clock to address any critical failures affecting safety and traffic operations.

11.1.5 Reporting, Documentation, and Audit Compliance

The Contractor shall maintain comprehensive records of all O&M activities, including:

(i) **Daily, weekly, and monthly reports** covering system performance, downtime, fault logs, and maintenance activities.

(ii) **Incident reports** detailing breakdowns, root cause analyses, and remedial actions taken.

(iii) **Asset registers** tracking all system components, including their maintenance history and replacement schedules.

(iv) **Compliance audits** to verify adherence to NHAI/MORTH guidelines, cybersecurity norms, and contractual obligations.

The Client shall have the right to conduct periodic audits, either directly or through third-party agencies, to verify the Contractor's compliance with O&M requirements. Any deficiencies identified shall be rectified within the timeframe stipulated by the Client.

11.1.6 Non-Performance and Penalties

Failure to comply with the stipulated O&M requirements shall result in penalties, including but not limited to:

(i) **Deductions from the Contractor's monthly O&M payments** based on service level deviations.

(ii) **Additional penalties for repeated failures** affecting critical infrastructure and traffic operations.

- (iii) **Contract termination in case of persistent non-compliance**, as per the termination clauses defined under the Contract.

11.1.7 Handover at Completion of O&M Period

Upon expiry of the O&M period, the Contractor shall hand over all system components in a fully operational state, along with updated documentation, software licenses, and access credentials. Any deficiencies noted during the final handover audit shall be rectified by the Contractor at their own cost before the formal transfer of responsibilities.

11.2 Post-Implementation Support & Operation & Maintenance (O&M)

11.2.1 General Obligations

Upon completion of system deployment, the Contractor shall provide comprehensive **Post-Implementation Support (PIS)** and **Operation & Maintenance Contract** services to ensure the continued functionality, reliability, and performance of all installed systems, hardware, software, and associated infrastructure.

The Post-Implementation Support period shall commence immediately after the successful commissioning and acceptance of the system and shall continue for a period as stipulated in the Contract. The O&M shall run concurrently or commence post-warranty, ensuring an uninterrupted service and maintenance framework.

The Contractor shall be responsible for but not limited to:

- (i) **System stability monitoring and proactive performance optimization.**
- (ii) **Timely troubleshooting, issue resolution, and patch management.**
- (iii) **Software updates, security patches, and firmware upgrades.**
- (iv) **Ensuring zero downtime beyond the allowable limits as per Service Level Requirements (SLRs).**
- (v) **Providing an escalation matrix with response and resolution timelines.**

Failure to maintain these obligations shall attract penalties as per the Performance Deductions Schedule.

11.2.2 Scope of Post-Implementation Support

The Contractor shall provide **Post-Implementation Support (PIS)** for the entire system, ensuring all components are functioning optimally and aligned with operational requirements. The scope of support shall include but not be limited to:

- (i) **Round-the-clock technical assistance (24x7 support)** through a centralized helpdesk.
- (ii) **Remote and on-site support** for troubleshooting and maintenance of all critical systems.
- (iii) **Performance monitoring and optimization** to ensure compliance with defined Key Performance Indicators (KPIs).
- (iv) **Real-time system health checks and diagnostics** to identify and rectify potential issues before failures occur.
- (v) **Training and capacity-building** of the Client's personnel for basic troubleshooting and operational handling.
- (vi) **Cybersecurity compliance** to protect against unauthorized access, malware, and data breaches.

11.2.3 Scope of Operation & Maintenance Contract

The O&M services shall cover all preventive and corrective maintenance activities necessary for the seamless operation of the system. The scope shall include:

- (i) **Hardware Maintenance & Repairs**
 - a. Routine inspection, cleaning, and calibration of installed equipment.
 - b. Replacement of faulty or degraded components at no additional cost during the O&M period.
 - c. Ensuring OEM-recommended servicing and repairs to extend asset lifespan.
- (ii) **Software & Firmware Updates**

- a. Regular application updates and bug fixes.
 - b. Implementation of security patches and firmware upgrades.
 - c. Enhancements to improve system functionality, subject to prior approval by the Client.
- (iii) **Data Backup & Disaster Recovery**
- a. Periodic **data backup and restoration** procedures.
 - b. Establishment of a **disaster recovery plan** to ensure service continuity in case of system failures.
 - c. Testing and validation of backup and recovery mechanisms at predefined intervals.
- (iv) **Performance Monitoring & Compliance Audits**
- a. Conducting routine audits to ensure the system meets contractual obligations.
 - b. Implementation of monitoring tools for **real-time system diagnostics**.
 - c. Generation of **monthly performance reports** for Client review.

11.2.4 Service Level Agreements (SLA) & Performance Benchmarks

The Contractor shall comply with the **Service Level Agreements (SLAs)** defined under the Contract, ensuring:

- (i) **System uptime requirements** as per RFP, calculated monthly.
- (ii) **Response time for critical failures:** as prescribed in the RFP.
- (iii) **Resolution time for critical failures:** as prescribed in the RFP.
- (iv) **Resolution time for non-critical failures:** as per RFP guidelines.
- (v) **Performance review meetings** to be conducted at intervals and in the manner defined in the RFP to assess compliance with contractual obligations.

Non-compliance with these SLAs shall lead to financial penalties and performance deductions in accordance with the Performance Deductions Schedule or as provided in the RFP.

11.2.5 Manpower & Resource Deployment

The Contractor shall deploy adequately skilled and qualified personnel to execute Operation & Maintenance services effectively. The team shall include:

- (i) **System Support Engineers** – Handling troubleshooting, updates, and repairs.
- (ii) **Cybersecurity & Data Protection Experts** – Ensuring security compliance and threat mitigation.
- (iii) **Field Technicians** – Responsible for physical inspections, repairs, and equipment replacements.

Additionally, the Contractor shall maintain a sufficient stock of **spare parts, consumables, and replacement components** to ensure minimal downtime in case of equipment failure.

11.2.6 Documentation, Reporting, and Compliance

The Contractor shall maintain comprehensive records of all O&M activities and provide periodic reports to the Client. Documentation shall include:

- (i) **Fault logs and root cause analyses** for all incidents.
- (ii) **Preventive maintenance schedules** and execution records.
- (iii) **Software update logs, including patches and enhancements.**
- (iv) **Inventory of spare parts and consumables utilized.**
- (v) **Compliance audit reports** ensuring adherence to NHAI/MoRTH standards.

The Client reserves the right to conduct independent audits to verify the Contractor's compliance with contractual requirements. Any deficiencies identified shall be rectified at the Contractor's expense within the stipulated timeframe.

11.2.7 Non-Performance & Penalties

Failure to meet the defined SLAs or O&M obligations shall attract penalties, including:

- (i) **Monetary deductions from O&M payments** for non-compliance.
- (ii) **Additional penalties for repeated failures affecting critical operations.**

- (iii) **Termination of the O&M contract for persistent breaches, with liability for damages.**

11.2.8 Transition & Handover Upon Completion of O&M

At the completion of the O&M period, the Contractor shall ensure a **smooth transition of operations** to either the Client or a new service provider. The transition process shall include:

- (i) **Handover of all system documentation, including updated manuals and maintenance records.**
- (ii) **Submission of final audit and compliance reports.**
- (iii) **Transfer of all software licenses, access credentials, and control rights to the Client.**
- (iv) **Exit training and knowledge transfer to the Client's personnel.**

Any pending maintenance issues or unresolved faults shall be rectified at the Contractor's cost prior to final handover.

11.3 Spare Parts & Consumables Management

11.3.1 General Requirements

The Contractor shall be responsible for maintaining an adequate stock of **spare parts and consumables** to ensure the **uninterrupted operation** of the system, in compliance with the **Service Level Agreement (SLA)**. The Contractor shall procure and supply all spare parts strictly in accordance with the **Original Equipment Manufacturer (OEM) specifications** and ensure their conformity with **MoRTH/NHAI, BIS, IS, and ISO standards**.

11.3.2 Minimum Stock Levels & Inventory Management

- (i) The Contractor shall maintain a **minimum inventory level** of critical spare parts, as identified in the project specifications, to facilitate immediate replacements and avoid system downtime.

- (ii) A **dedicated storage facility** shall be established near the project site to house all spare parts and consumables, ensuring secure and organized storage.
- (iii) The Contractor shall implement a **real-time inventory tracking system** for monitoring stock levels, usage, and replenishment schedules.

11.3.3 Replacement Policy & Quality Assurance

- (i) All consumables, including but not limited to **lubricants, filters, cables, and batteries**, shall be supplied as part of the **Operation & Maintenance Contract (O&M)** without any additional cost to the Employer.
- (ii) The Contractor shall conduct periodic **quality inspections** of spare parts and consumables to ensure compliance with prescribed standards. Any defective, expired, or non-conforming items shall be **immediately replaced** at no additional cost.

11.3.4 Logistics & Lead Time

- (i) The Contractor shall ensure that spare parts for **critical system components** are available for immediate replacement, with a **maximum lead time** of **24 hours** for high-priority components.
- (ii) For imported components, the Contractor shall **pre-stock critical spare parts** in anticipation of long procurement lead times, ensuring system uptime as per SLA requirements.

11.3.5 Ownership & Handover

- (i) The System Integrator (SI) shall be responsible for maintaining an adequate inventory of spare parts and consumables at all times to ensure system uptime and service continuity, as per the functional and performance requirements specified in the RFP. These spares shall be arranged and managed by the SI at its own cost and risk.
- (ii) All spare parts and consumables utilized during maintenance activities shall become the property of the Employer upon installation.

- (iii) At the end of the contract period, the SI shall hand over all remaining functional and unused spare parts and consumables, maintained for system uptime assurance, along with a complete inventory report, in good condition.

11.3.6 Compliance with SLA & ATMS Operational Continuity

- (i) The Contractor shall ensure that all spare parts and tools required for the maintenance of the **Advanced Traffic Management System (ATMS)** are available at all times to maintain compliance with SLA terms.
- (ii) Any failure to meet the SLA-defined uptime and response time requirements due to non-availability of spare parts shall be deemed a **contractual breach**, subject to penalties as per the contract.

11.4 End-of-Life & System Upgradation

11.4.1 General Requirements

The Contractor shall ensure that all systems, components, and assets deployed under this Agreement are maintained and upgraded to meet the required performance standards throughout their lifecycle. In the event that any system or component reaches its **End-of-Life (EOL)**, or is deemed obsolete due to technological advancements, the Contractor shall promptly initiate the process of **system upgradation** or **replacement**, ensuring that such actions do not compromise the performance, safety, or compliance with **MoRTH/NHAI regulations, International Standards**, or the **Service Level Agreements (SLA)** established herein. The upgradation process shall be aligned with the goals of **future-proofing** the system, maintaining its optimal functionality, and ensuring compliance with prevailing industry best practices.

11.4.2 End-of-Life Management

The **End-of-Life (EOL)** of any system, component, or technology shall be determined by the **Original Equipment Manufacturer (OEM)** or an industry

standard that reflects obsolescence in the context of traffic management systems. The Contractor shall be responsible for monitoring the lifecycle of all installed components, identifying items approaching their **EOL** and **obsolescence** prior to failure, and taking preemptive measures to ensure continuity of operations.

Upon identification of **EOL** components, the Contractor shall notify the Employer and NHA of such items at least **six (6) months** in advance of the anticipated obsolescence, providing detailed information regarding the nature of the obsolescence, its impact on the system, and the proposed course of action, which may include system upgradation, replacement, or reengineering.

11.4.3 System Upgradation

(i) **Upgradation Requirements**

In the event that **system upgradation** is required due to **technological advancements, EOL components**, or changes in **MoRTH/NHA regulations**, the Contractor shall prepare a detailed **Upgradation Plan** for the Employer's review and approval. This plan shall include, but not be limited to:

- A comprehensive list of components, software, and hardware requiring upgrades or replacements;
- a. Specification of new equipment, technologies, and methodologies that will be integrated into the system;
- b. Detailed timelines for implementation, ensuring minimal disruption to the operation of the system;
- c. Impact assessment of the proposed upgradation on the overall system performance, compliance, and **SLA** obligations;
- d. Costs associated with the upgradation, with a clear breakdown of material, labor, and overhead costs;
- e. Necessary documentation, approvals, and certifications from the **OEM, MoRTH**, or other relevant bodies.

(ii) **Performance and Compliance Standards**

Any **system upgradation** shall comply with the applicable **MoRTH/NHA** standards, **BIS, ISO**, and relevant **industry-specific regulations**. The

upgradation shall ensure that the system is capable of meeting the **service levels** and **uptime** requirements as specified in the **SLA**, and that all upgraded components are fully compatible with the existing infrastructure. Further, the system upgradation shall be designed to incorporate **future technologies** that anticipate evolving requirements in **Advanced Traffic Management Systems (ATMS)**, ensuring that the system remains scalable, resilient, and future-ready.

(iii) **Testing and Commissioning**

Upon completion of any upgradation activities, the Contractor shall conduct **comprehensive testing** and **commissioning** of the upgraded system, including all new components and technologies. The testing shall verify the proper functionality of the entire system, ensuring that all **SLA performance metrics** are met, and that all upgrades comply with the technical specifications outlined in the contract, including compatibility with existing systems. The Contractor shall provide test results and certification for the Employer's approval before the upgraded system is put into full operation.

11.4.4 Spare Parts and Upgradation

The Contractor shall ensure the availability of **spare parts** and **consumables** for all upgraded components for the duration of the **System Life Cycle**, in accordance with the provisions outlined in **Clause 9.2: Spare Parts**. All spare parts provided for upgradation shall be of equivalent or superior quality to the original specifications and be sourced from approved **OEMs**. The Contractor shall also provide a detailed **Inventory Management Plan** for the upgraded components, including a list of **minimum stock levels** and **lead times** for delivery and replacement.

11.4.5 Warranty and Support for Upgraded Systems

The warranty and support requirements for all **upgraded systems** shall align with the **original warranty terms**, as specified by the **OEM**, or shall be extended in accordance with the upgradation scope. The Contractor shall provide a **minimum warranty period of one (1) year** for the upgraded system and its components, commencing from the **commissioning date** of the upgradation.

The warranty shall cover all defects, malfunctions, and failures of the upgraded components, ensuring that the system remains fully operational and compliant with the agreed performance standards.

Additionally, the Contractor shall offer **Post-Implementation Support** and **Operation & Maintenance Contracts (O&M)** as specified in **Clause 11.2**, to ensure the continued support, maintenance, and enhancement of the upgraded system throughout its operational life.

11.4.6 Documentation and Compliance

The Contractor shall provide comprehensive documentation for all system upgradations, including but not limited to:

- (i) **As-built drawings** of the upgraded system and components;
- (ii) Updated **technical specifications, user manuals, and maintenance manuals**;
- (iii) Certificates of compliance with applicable **MoRTH/NHAI, BIS, and ISO** standards;
- (iv) Documentation for all **OEM certifications**, warranties, and support agreements.

The Contractor shall ensure that all upgradation activities are fully documented, and that the documentation is provided to the Employer and relevant authorities as part of the handover process.

11.4.7 Periodic Review and Future Upgrades

The Contractor shall participate in **periodic reviews** of the system, conducted by the Employer or NHAI, to assess the ongoing performance of the system and identify potential areas for further upgradation. Such reviews shall be conducted at intervals no greater than **every two (2) years** during the operational phase of the contract. The Contractor shall assist in identifying opportunities for system enhancement, whether through the introduction of new technologies, system architecture changes, or integration of updated standards and best practices. Any recommended upgrades shall be evaluated for potential inclusion in future contracts or extensions of the agreement.

12 Future-Proofing & Technological Compliance

12.1 Scalability & Expandability of the ATMS System

12.1.1 General Requirements

The Contractor shall ensure that the **Advanced Traffic Management System (ATMS)** is designed, developed, and deployed in a manner that facilitates **scalability** and **expandability** throughout its operational lifecycle. The system architecture shall allow for seamless integration of additional functionalities, modules, and new technologies without requiring major structural modifications or service disruptions. The scalability provisions shall align with **NHAI/MoRTH standards, international best practices**, and the evolving needs of **intelligent transportation systems (ITS)**.

12.1.2 Modular & Scalable System Architecture

The ATMS shall be based on a **modular architecture**, enabling incremental enhancements and expansion while maintaining system integrity and performance. The design shall ensure:

- (i) **Horizontal Scalability:** The system shall support the integration of additional **field devices, sensors, and traffic management components** without affecting the existing operations.
- (ii) **Vertical Scalability:** The system shall accommodate **increased data processing and computing power** as traffic demand grows and more advanced functionalities are introduced.
- (iii) **Interoperability:** The system shall be interoperable with **third-party applications, cloud-based platforms, and IoT-enabled devices**, allowing seamless communication and integration.
- (iv) **Redundancy & Load Balancing:** The system shall be designed to distribute processing loads efficiently, avoiding single points of failure and ensuring **high availability (HA)** and **fault tolerance**.

12.1.3 Expansion Provisions for Future Technologies

The ATMS shall be **future-ready**, with built-in provisions to integrate emerging technologies such as:

- (i) **Artificial Intelligence (AI) & Machine Learning (ML)** for predictive traffic analysis and automated incident management.
- (ii) **5G & Edge Computing** to enhance real-time data processing and reduce latency.
- (iii) **Connected & Autonomous Vehicles (CAV) Infrastructure** to support future intelligent transportation networks.
- (iv) **Big Data & Cloud Integration** for advanced analytics and storage scalability.
- (v) **Cybersecurity Frameworks** to ensure continued protection against evolving threats.

The Contractor shall ensure that system interfaces, data communication protocols, and processing capabilities are adaptable for integrating these technologies without requiring a complete overhaul of the existing infrastructure.

12.1.4 Network & Communication Scalability

The ATMS network infrastructure shall support **scalable bandwidth**, ensuring uninterrupted data flow as system components expand. The Contractor shall:

- (i) Ensure **fiber optic networks, wireless communication channels, and satellite-based links** are adaptable for future enhancements.
- (ii) Provide a **network expansion roadmap**, detailing how additional communication nodes, data centers, and cloud services can be integrated over time.
- (iii) Ensure **fail-safe mechanisms** are in place to handle increased data loads, preventing latency and performance degradation.

12.1.5 Hardware & Software Expansion Policy

The Contractor shall adopt a **hardware and software expansion policy** that allows:

- (i) **Incremental upgrades** rather than full system replacements.
- (ii) Use of **standardized, non-proprietary** hardware and software components to avoid vendor lock-in.
- (iii) **Backward compatibility** to ensure newer system modules remain functional with existing components.
- (iv) **Upgradable firmware & software versions** to support continuous enhancements without requiring new hardware installations.

12.1.6 Testing & Commissioning of System Expansions

All expansions shall undergo **rigorous testing and commissioning**, ensuring compliance with:

- (i) **NHAI/MoRTH specifications**
- (ii) **IEC, ISO, and IEEE international standards**
- (iii) **Cybersecurity and data protection guidelines**

The Contractor shall provide **updated documentation, user manuals, and operational training** for each system expansion, ensuring seamless adoption and integration by the Employer.

12.1.7 Periodic Scalability Reviews

The ATMS shall undergo **bi-annual scalability assessments** to evaluate its capacity to accommodate future expansions. The Contractor shall submit a **Scalability Review Report**, detailing:

- (i) **System** performance under current load.
- (ii) Potential areas for expansion and enhancement.
- (iii) Recommendations for phased upgrades aligned with technological advancements.

The Employer shall have the right to mandate **upgrades and capacity enhancements** based on the Contractor's findings and evolving infrastructure needs.

12.2 Compliance with Emerging Technologies & Standards

12.2.1 General Requirements

The Contractor shall ensure that the **Advanced Traffic Management System (ATMS)** remains fully compliant with evolving **technological advancements, international standards, and regulatory requirements** throughout its lifecycle. The system shall be adaptable to accommodate future innovations in **traffic management, intelligent transportation systems (ITS), cybersecurity, and data processing** without requiring a complete overhaul.

The Contractor shall demonstrate compliance with the latest versions of:

- (i) **National Standards:** NHAI/MoRTH guidelines, BIS/IS codes, and any other regulatory mandates applicable to traffic management systems.
- (ii) **International Standards:** ISO, IEC, IEEE, ITU, and other globally accepted frameworks for system integration, cybersecurity, and data exchange.
- (iii) **Industry Best Practices:** Intelligent transport systems (ITS) compliance per **ISO 14813**, cybersecurity provisions as per **ISO/IEC 27001**, and interoperability with global ATMS architectures.

12.2.2 Adoption of Emerging Technologies

The ATMS shall be **future-ready** and designed to integrate emerging technologies as they become commercially viable and operationally relevant. The Contractor shall ensure that:

- (i) **Artificial Intelligence (AI) & Machine Learning (ML)** algorithms are incorporated to enhance predictive analytics, congestion detection, and incident management.
- (ii) **5G & Edge Computing** capabilities are supported for low-latency, real-time processing of traffic data.
- (iii) **Blockchain & Cybersecurity Measures** are integrated to safeguard sensitive traffic data, ensuring compliance with data protection laws.

- (iv) **Autonomous & Connected Vehicles (CAV) Infrastructure** is incorporated, allowing seamless communication between **vehicle-to-infrastructure (V2I)** and **vehicle-to-vehicle (V2V)** networks.
- (v) **Big Data Analytics & Cloud Integration** are enabled to improve real-time decision-making, historical data analysis, and system-wide scalability.
- (vi) **Digital Twin Technology** is supported, allowing real-time simulation of the ATMS for predictive maintenance and strategic traffic planning.

12.2.3 Interoperability & Standardized Protocols

The ATMS shall adhere to **open-standard communication protocols**, ensuring seamless **integration, data exchange, and compatibility** with:

- (i) **Other ATMS Platforms** deployed across different jurisdictions.
- (ii) **Third-party Applications**, including emergency response systems, smart city dashboards, and tolling mechanisms.
- (iii) **IoT Devices & Sensor Networks**, including ANPR cameras, RFID tags, and air quality monitors.
- (iv) **Cloud-Based Data Management Systems**, ensuring flexible, remote access to traffic data and analytics.

The system shall comply with **ITS standards** such as:

- (i) **ISO 14813**: Framework for intelligent transport systems (ITS).
- (ii) **ISO 21217 & ISO 15118**: Standards for V2X (Vehicle-to-Everything) communications.
- (iii) **IEEE 802.11p**: Wireless communication standards for vehicular networks.
- (iv) **ISO/IEC 27001 & NIST Frameworks**: Cybersecurity compliance for protecting ATMS infrastructure from cyber threats.

12.2.4 Continuous Compliance Monitoring & Upgradation

To ensure ongoing compliance with technological advancements, the Contractor shall:

- (i) Conduct **bi-annual compliance assessments**, ensuring the ATMS aligns with **latest standards, regulatory changes, and industry best practices**.

- (ii) Submit an **Emerging Technology Compliance Report**, outlining necessary system upgrades, security patches, and integration roadmaps.
- (iii) Provide a **technology upgrade timeline**, ensuring gradual adoption of new technologies without disrupting system operations.
- (iv) Maintain a **compliance register**, documenting adherence to national and international ITS standards.

12.2.5 Cybersecurity & Data Protection Compliance

The Contractor shall ensure that the ATMS adheres to the latest **cybersecurity frameworks and data protection laws**, mitigating risks associated with:

- (i) **Unauthorized data access, hacking, and cyber threats.**
- (ii) **Data breaches affecting real-time traffic monitoring and control systems.**
- (iii) **Failure to comply with national cybersecurity regulations (e.g., CERT-In guidelines) and international security standards (ISO 27001, NIST, GDPR where applicable).**

The system shall feature:

- (i) **End-to-end encryption** for secure data transmission.
- (ii) **Multi-layer authentication mechanisms** for user access.
- (iii) **AI-driven anomaly detection** to identify and prevent cyber threats.
- (iv) **Regular security audits** to assess vulnerabilities and implement necessary patches.

12.2.6 Compliance with Environmental & Sustainable Standards

The ATMS shall adhere to environmental sustainability principles, including:

- (i) **Energy-efficient hardware & eco-friendly materials**, reducing the carbon footprint of system installations.
- (ii) **Green IT principles**, minimizing power consumption in data centers and field devices.
- (iii) **ISO 14001 Environmental Management System Compliance**, ensuring sustainable deployment and operation of ATMS infrastructure.

12.2.7 Contractual Obligations for Compliance & Future-Proofing

The Contractor shall:

- (i) Ensure **all new system deployments, modifications, and integrations** conform to evolving technological and regulatory frameworks.
- (ii) Conduct **training sessions for stakeholders** on updated standards and emerging technologies.
- (iii) Provide a **Future Compliance Assurance Plan (FCAP)**, detailing how the ATMS will maintain alignment with **emerging ITS trends, national mandates, and international best practices**.

12.2.8 Non-Compliance & Penalties

In the event of **non-compliance** with the stipulated technological standards, the Employer shall have the right to:

- (i) Direct the Contractor to **undertake corrective actions** at no additional cost.
- (ii) Withhold payments for non-compliant system upgrades.
- (iii) Impose penalties for any delay in ensuring compliance with revised technological frameworks.

12.3 Upgrade & Enhancement Policies

12.3.1 General Requirements

The Contractor shall ensure that the **Advanced Traffic Management System (ATMS)** remains technologically relevant, functionally efficient, and operationally sustainable through a structured **Upgrade & Enhancement Policy**. The system must be capable of seamless upgrades to accommodate advancements in hardware, software, and regulatory frameworks, ensuring continuous compliance with **NHAI/MoRTH standards, international best practices, and emerging industry norms**.

The upgrade framework shall include:

- (i) **Planned System Enhancements** based on technological advancements and evolving traffic management needs.
- (ii) **Preventive Upgrades & Security Patching** to address vulnerabilities, improve system resilience, and maintain compliance with cybersecurity regulations.
- (iii) **Scalability Measures** ensuring smooth integration of new modules, additional sensors, and advanced AI-driven analytics.
- (iv) **Minimized Downtime Strategies**, ensuring uninterrupted ATMS functionality during upgrades.

12.3.2 Upgrade Planning & Implementation Framework

The Contractor shall develop and maintain a **System Upgrade & Enhancement Roadmap (SUER)** detailing:

- (i) **Periodic technology assessments** to determine necessary upgrades in hardware and software.
- (ii) **Impact evaluation studies** prior to implementing upgrades, ensuring minimal disruption to operations.
- (iii) **Backward compatibility assurance**, ensuring upgrades do not render existing components obsolete.
- (iv) **Stakeholder training & documentation** for newly introduced features and operational modifications.

12.3.3 Types of Upgrades & Enhancements

(A) Software Upgrades

The Contractor shall ensure that the ATMS software remains up-to-date through:

- (i) **Patch Management & Security Updates**, addressing vulnerabilities and enhancing system security per **ISO/IEC 27001, NIST, and CERT-In guidelines**.
- (ii) **Functional Enhancements**, incorporating **AI-based traffic prediction, machine learning (ML) analytics, and advanced data visualization**.

- (iii) **Interoperability Updates**, ensuring seamless integration with **emerging smart city applications, IoT-based traffic monitoring, and V2X (Vehicle-to-Everything) technologies**.
- (iv) **Regulatory Compliance Updates**, aligning the system with revised **NHAI/MoRTH mandates, BIS/IS standards, and international best practices**.

(B) Hardware Upgrades

The Contractor shall:

- (i) Replace outdated sensors, controllers, and **ITS field devices** with **newer, energy-efficient, and more accurate models**.
- (ii) Upgrade **network infrastructure**, ensuring **higher bandwidth, reduced latency, and support for 5G communications**.
- (iii) Implement **redundancy measures**, minimizing single-point failures through backup power supply, secondary data centers, and fault-tolerant components.
- (iv) Ensure **compliance with ISO 14001 Environmental Standards**, prioritizing energy-efficient and sustainable hardware components.

(C) Cybersecurity Enhancements

The ATMS shall undergo **periodic cybersecurity assessments** and necessary enhancements, including:

- (i) **Integration of AI-driven threat detection algorithms** to identify vulnerabilities in real-time.
- (ii) **Implementation of Blockchain & Zero Trust Architecture** for securing sensitive traffic data.
- (iii) **Deployment of multi-layer authentication and end-to-end encryption (AES-256, SSL/TLS 1.3)** for system access.
- (iv) **Compliance with ISO/IEC 27032 (Cybersecurity for ITS) and NIST Cybersecurity Framework**, ensuring secure traffic data transmission.

12.3.4 Upgrade Execution Plan & Responsibilities

The Contractor shall:

- (i) Provide a **bi-annual upgrade proposal**, detailing the required software and hardware enhancements.

- (ii) Develop a **System Upgrade Implementation Plan (SUIP)**, outlining timelines, resource allocation, and risk mitigation strategies.
- (iii) Ensure that **upgrades are executed without affecting the operational continuity** of the ATMS, implementing rollback mechanisms in case of failures.
- (iv) Coordinate with the Employer for the approval of **major system enhancements**, ensuring compliance with regulatory guidelines.

12.3.5 Service-Level Commitments & Performance Assurance

The Contractor shall maintain **Service Level Agreements (SLAs)** ensuring:

- (i) System uptime shall be maintained as per the requirements specified in the RFP. Scheduled downtime, if any, shall also be limited to the duration and frequency prescribed in the RFP.
- (ii) **Performance benchmarks** for upgraded components, including improved **data processing speed, AI analytics accuracy, and latency reduction**.
- (iii) **Post-upgrade validation tests**, including functional, security, and performance testing.
- (iv) **Corrective actions & penalties for upgrade failures**, ensuring accountability for system performance post-enhancement.

12.3.6 Documentation & Compliance Reporting

The Contractor shall:

- (i) Maintain **detailed documentation** of all software and hardware upgrades, including test reports and validation certificates.
- (ii) Submit **quarterly compliance reports**, ensuring continued alignment with MoRTH/NHAI, BIS/IS, and international standards.
- (iii) Provide **comprehensive training & knowledge transfer** sessions for system operators, ensuring smooth adaptation to upgraded functionalities.

12.3.7 Penalties for Non-Compliance & Delayed Upgrades

In the event of **non-compliance or delayed upgrades**, the Employer shall have the right to:

- (i) **Impose financial penalties** for failure to execute planned upgrades within the stipulated timeline.
 - (ii) **Terminate the maintenance contract**, if the Contractor is unable to maintain the system at par with industry standards.
 - (iii) **Engage third-party vendors at the Contractor's cost**, in case of non-performance in executing required upgrades.
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13 Compliance, Audits & Safety

13.1 Audit Rights & Compliance with Laws

13.1.1 General Provisions

The Contractor shall ensure full compliance with all applicable laws, regulations, and contractual obligations concerning the **operation, maintenance, and performance of the Advanced Traffic Management System (ATMS)**. The Employer, or its designated representatives, shall have unrestricted rights to conduct **audits, inspections, and compliance reviews** to verify adherence to statutory, regulatory, and contractual requirements.

The Contractor shall:

- (i) Maintain **accurate and up-to-date records** of all activities related to system installation, maintenance, and performance.
- (ii) Grant **full access to records, documents, financial statements, and operational data** to authorized auditors upon request.
- (iii) Ensure that all documentation is **archived in a secure and accessible manner** for the contract duration and any extended period mandated by law.

13.1.2 Compliance with Applicable Laws & Regulations

The Contractor shall at all times comply with:

- (i) **Indian laws, rules, and regulations**, including but not limited to:
 - a. The **Motor Vehicles Act, 1988** and subsequent amendments.
 - b. The **Information Technology Act, 2000**, particularly for data security and electronic transactions.
 - c. The **Environmental Protection Act, 1986**, for sustainable waste disposal and pollution control.
 - d. The **Factories Act, 1948**, and the **Occupational Safety, Health, and Working Conditions Code, 2020** for workplace safety.
- (ii) **NHAI & MoRTH regulations**, including the latest guidelines for Intelligent Transport Systems (ITS) and traffic monitoring infrastructure.

- (iii) **International standards**, where applicable, such as **ISO 9001 (Quality Management Systems)**, **ISO 14001 (Environmental Management Systems)**, and **ISO 27001 (Information Security Management Systems)**.

13.1.3 Audit & Inspection Rights

The Employer reserves the right to conduct **scheduled and unscheduled audits** to verify compliance with contractual obligations. Such audits may include:

- (i) **Technical Audits**, ensuring that the ATMS hardware and software comply with performance benchmarks.
- (ii) **Financial Audits**, ensuring transparency in pricing, cost management, and adherence to approved budgets.
- (iii) **Operational Audits**, assessing maintenance activities, spare parts management, and adherence to SLAs.
- (iv) **Security & Data Protection Audits**, ensuring that **cybersecurity, personal data handling, and IT system protocols** comply with MoRTH and ISO 27001 requirements.

The Contractor shall:

- (i) **Cooperate fully with audit teams** by providing necessary access to systems, personnel, and data.
- (ii) **Rectify any non-conformities identified** within a stipulated time frame, as directed by the Employer.
- (iii) **Not restrict or delay audit processes**, failure of which may lead to financial penalties or contract termination.

13.1.4 Reporting & Remedial Action

Following an audit, the Employer shall provide an **Audit Observation Report**, detailing any deficiencies or non-compliance issues. The Contractor shall:

- (i) Submit a **Corrective Action Plan (CAP)** within **15 working days**, outlining remedial measures.
- (ii) Ensure **implementation of corrective actions** within the timeframe agreed upon with the Employer.

- (iii) Bear **all costs associated with corrective actions** if deficiencies arise due to the Contractor's failure to comply with contract provisions.

13.1.5 Penalties for Non-Compliance

In case of non-compliance with audit findings, the Employer shall have the right to:

- (i) **Impose financial penalties** as per the contract's penalty framework.
- (ii) **Suspend or terminate the contract** in case of repeated violations or failure to meet compliance requirements.
- (iii) **Engage third-party auditors at the Contractor's cost**, if repeated failures in compliance are observed.

13.2 Workplace Safety & Occupational Hazards

13.2.1 General Obligations

The Contractor shall be solely responsible for ensuring a **safe, hazard-free working environment** for all personnel engaged in the Works. The Contractor shall comply with all applicable workplace safety laws, including but not limited to:

- (i) The **Building and Other Construction Workers (Regulation of Employment and Conditions of Service) Act, 1996**
- (ii) The **Occupational Safety, Health, and Working Conditions Code, 2020**
- (iii) The **Factories Act, 1948** (where applicable)
- (iv) MoRTH, IRC, and relevant **ISO standards, including ISO 45001** (Occupational Health & Safety)

This clause shall be read **in conjunction with Clause 10.3 (HSE Compliance)**, which governs **project-wide safety and environmental obligations**.

13.2.2 Occupational Risk Assessments & Worker Welfare

- (i) The Contractor shall conduct a **detailed Occupational Hazard Risk Assessment (OHRA)** before commencing work, identifying all potential risks related to:
 - a. **Heavy machinery & lifting operations**
 - b. **Excavation, confined spaces & hazardous environments**
 - c. **Electrical & fire hazards**
 - d. **Heat stress, fatigue management & ergonomics**
- (ii) The Contractor shall establish **Worker Welfare Facilities**, including:
 - a. **Adequate rest areas, drinking water, sanitation, and first aid stations**
 - b. **Fire & emergency response facilities at site offices and work zones**

13.2.3 PPE & Safe Work Practices

- (i) Mandatory PPE Requirements:
 - a. The Contractor shall ensure **all workers wear prescribed PPE** (helmets, safety boots, gloves, eye protection, high-visibility vests, ear protection, and respiratory masks where necessary).
 - b. Non-compliance shall result in immediate disciplinary action.
- (ii) **Work at Height & Confined Spaces:**
 - a. All height work **above 2m shall require full-body harnesses with double lanyards** and secure anchoring.
 - b. **Confined space entry shall require a permit system**, continuous gas monitoring, and an emergency retrieval plan.
- (iii) **Lifting & Rigging Safety:**
 - a. Only trained and certified personnel shall be allowed to operate cranes and hoisting equipment.
 - b. **Lifting tools & tackles shall be third-party certified** and subject to regular inspections.
- (iv) **Traffic & Site Safety Measures:**
 - a. Safety barricading, warning signage, and reflective markings shall be installed as per **IRC SP 55:2014**.
 - b. Traffic marshals and LED warning blinkers shall be deployed at high-risk zones.

13.2.4 Workplace Safety Audits & Corrective Actions

- (i) The Employer shall conduct **random safety inspections and audits** to ensure compliance with safety protocols.
- (ii) Any **workplace hazard identified during inspections** must be rectified within **48 hours**, failing which the Employer may impose **penalties, work stoppages, or contract termination**.

13.2.5 Incident Reporting & Contractor's Liability

- (i) **All accidents, near-misses, and occupational illnesses must be reported immediately** to the Employer.
- (ii) A **Root Cause Analysis (RCA) Report** shall be submitted **within 24 hours**, along with preventive measures to avoid recurrence.
- (iii) The Contractor shall be **fully liable for any worker injury, fatality, or occupational disease** resulting from non-compliance with safety obligations.
- (iv) The Employer reserves the right to **deduct penalties from Contractor's payments or Performance Bank Guarantee (PBG)** for repeated safety violations.

13.2.6 Insurance & Compensation for Workplace Accidents

- (i) The Contractor shall **maintain valid Workmen's Compensation Insurance (WCI)** or Employer's Liability Insurance (ELI) covering all workers and staff engaged in the Works.
- (ii) In case of **worker injury or fatality**, the Contractor shall:
 - a. Provide **immediate medical assistance and compensation** as per statutory requirements.
 - b. Bear all costs related to medical treatment, hospitalization, and rehabilitation.
 - c. Submit **incident reports and compensation disbursement proof** to the Employer.

13.3 Anti-Corruption & Ethical Practices

13.3.1 General Obligations

- (i) The Contractor shall ensure the highest standards of **ethics, integrity, and transparency** in all contractual dealings, strictly prohibiting any form of corruption, bribery, or unethical conduct.
- (ii) The Contractor shall comply with:
 - a. **The Prevention of Corruption Act, 1988** and any amendments thereof.
 - b. **The Integrity Pact** as prescribed by the National Highways Infra Trust (NHIT), which shall be a binding commitment for the Contractor.
 - c. **NHIT's Anti-Corruption Policy**, which outlines ethical obligations, reporting mechanisms, and penalties for violations.
 - d. All applicable provisions of **Indian and international anti-corruption laws**, including the **Foreign Corrupt Practices Act (FCPA) (if applicable)** and the **UK Bribery Act, 2010** (for international transactions).

13.3.2 Prohibition of Corrupt, Fraudulent & Collusive Practices

- (i) The Contractor shall not, directly or indirectly, engage in:
 - a. **Bribery:** Offering, giving, receiving, or soliciting anything of value to influence decisions.
 - b. **Collusion:** Arrangements with competitors or third parties to manipulate procurement, tendering, or project execution processes.
 - c. **Fraudulent Practices:** Misrepresentation, falsification of records, or providing misleading information to the Employer.
 - d. **Coercive Practices:** Threatening, intimidating, or using unlawful means to obtain an advantage.
- (ii) If any of the above practices are detected, the Employer reserves the right to:
 - a. **Terminate the contract immediately, without liability.**
 - b. **Blacklist the Contractor** from future tenders/projects.
 - c. **Forfeit the Performance Bank Guarantee (PBG) and recover damages.**

- d. **Report the violation to the competent law enforcement authorities.**

13.3.3 Integrity Pact & Contractor's Declaration

- (i) The Contractor shall sign the **Integrity Pact**, agreeing to:
 - a. **Disclose any conflicts of interest** and avoid engagements that may compromise impartiality.
 - b. **Not engage in unethical payments, gifts, or hospitality** to NHIT officials or Employer representatives.
 - c. **Report any attempts of corruption, undue influence, or illegal activities** to NHIT's Anti-Corruption Compliance Officer.
 - d. **Fully cooperate in corruption investigations** conducted by NHIT or any regulatory body.
- (ii) The Employer reserves the right to conduct **integrity audits, background checks, and financial investigations** on the Contractor at any stage of the Contract.

13.3.4 Whistleblower Protection & Reporting Mechanism

- (i) NHIT shall establish a **confidential reporting mechanism** (e.g., email, hotline, or grievance portal) for reporting suspected corruption, fraud, or unethical behavior.
- (ii) The Contractor shall **not retaliate against whistleblowers** who report violations in good faith.
- (iii) Any false reporting with malicious intent shall be subject to disciplinary and legal consequences.

13.3.5 Enforcement & Consequences of Non-Compliance

- (i) **In case of a confirmed corruption violation**, the Employer reserves the right to:
 - a. **Suspend or terminate the contract** with immediate effect.
 - b. **Impose financial penalties** as per the Integrity Pact provisions.
 - c. **Initiate legal proceedings under the Prevention of Corruption Act, 1988.**

- (ii) If the Contractor is found guilty of corrupt practices by a competent authority, NHIT shall have the right to:
 - a. **Blacklist the Contractor and its key personnel.**
 - b. **Report the matter to law enforcement agencies and regulatory bodies.**
-

14 Force Majeure

14.1 Definition of Force Majeure

14.1.1 Force Majeure Events

A **Force Majeure Event** refers to any **unforeseeable, extraordinary, and unavoidable** circumstance beyond the **reasonable control of the Affected Party**, preventing or delaying the performance of contractual obligations. Such events include but are not limited to:

- (i) **Natural Disasters (Acts of God):**
 - a. Earthquakes, floods, cyclones, tsunamis, storms, lightning, landslides, or extreme weather conditions.
- (ii) **Civil & Political Disturbances:**
 - a. War (declared or undeclared), hostilities, terrorism, sabotage, riots, civil unrest, insurrection, or blockades.
- (iii) **Governmental & Legal Actions:**
 - a. Nationalization, expropriation, embargoes, trade restrictions, or new legislative/regulatory actions that impact contract execution.
- (iv) **Epidemics & Pandemics:**
 - a. Widespread disease outbreaks, as officially declared by **WHO, the Government of India, or any competent authority**.
- (v) **Industrial & Labor Disruptions:**
 - a. General strikes, lockouts, or labor disputes affecting the industry as a whole (excluding disputes caused by the Contractor's failure to comply with labor laws).
- (vi) **Infrastructure & Utility Failures:**
 - a. Extended power failures, destruction of critical communication systems, or disruption of essential transportation networks.

14.1.2 Exclusions from Force Majeure

The following events **shall not qualify** as Force Majeure:

- (i) Shortage of labor, raw materials, or machinery, unless caused directly by an eligible Force Majeure event.
- (ii) Contractor's failure to secure necessary approvals, permits, or statutory clearances due to its own default.
- (iii) Financial distress, insolvency, or lack of funds.
- (iv) Any foreseeable risk that could have been mitigated through reasonable due diligence.

14.2 Procedure for Notification

14.2.1 Immediate Reporting

- (i) The **Affected Party** must notify the other Party in **writing within 24 hours** of becoming aware of a Force Majeure Event. The notification shall include:
 - a. Description of the event and its cause.
 - b. Expected impact on contractual obligations.
 - c. Proposed mitigation measures.
- (ii) The Affected Party shall provide **documentary evidence** (such as meteorological reports, government orders, or third-party certifications) within **seven (7) days** to substantiate the claim.

14.2.2 Obligation to Mitigate

- (i) The **Contractor shall take all reasonable measures** to minimize disruption and resume contractual performance at the earliest possible time.
- (ii) The **Client may instruct alternative execution methods** or partial performance, if feasible.

14.3 Consequences & Remedies

14.3.1 Suspension of Obligations

- (i) If a Force Majeure Event **substantially prevents performance for more than thirty (30) consecutive days**, the Parties shall jointly review contract continuation feasibility.
- (ii) The **Client may approve temporary suspension** of contractual obligations without penalty, provided the Contractor submits an action plan for resumption.

14.3.2 Termination Due to Prolonged Force Majeure

- (i) If a Force Majeure Event **persists beyond ninety (90) days**, either Party may terminate the Contract with a **seven (7) day written notice**.
- (ii) In such a case:
 - a. The **Contractor shall be compensated** for work completed as per the agreed **milestone-based payment structure**.
 - b. **No penalties, liquidated damages, or Performance Bank Guarantee (PBG) forfeiture** shall apply.
 - c. The **Contractor shall ensure an orderly handover** of all materials, records, and documents to the Client.

14.3.3 Dispute Resolution for Force Majeure Claims

- (i) Any disputes regarding:
 - a. Whether an event qualifies as Force Majeure.
 - b. The extent of time/cost compensation.
 - c. Contractor's obligations during suspension.... shall be resolved under Clause **16 (Dispute Resolution Mechanism)**, in accordance with **SAROD Arbitration**.
- (ii) The burden of proof **rests on the Affected Party** to establish that:
 - a. The event was beyond its reasonable control.
 - b. The event directly and materially impacted performance.
 - c. All reasonable mitigation efforts were undertaken.

15 Contract Suspension & Termination

15.1 Suspension of Work

15.1.1 Authority to Suspend Work

The **Client** reserves the right to suspend, in whole or in part, the **design, supply, installation, integration, testing, commissioning, and operationalization** of the **Advanced Traffic Management System (ATMS)** for reasons including, but not limited to, administrative requirements, technical modifications, force majeure events, or contractual disputes. Suspension shall be communicated through a **formal written notice** specifying the **effective date, duration, and reason for suspension**.

15.1.2 Valid Grounds for Suspension

The following shall be recognized as **valid grounds** for suspension:

- (i) **Client-Ordered Suspension for Administrative Reasons**
 - a. **Re-evaluation of the ATMS project scope**, design modifications, or unforeseen site conditions.
 - b. **Delays in regulatory approvals or permits** beyond the Contractor's control.
 - c. **Budgetary or funding constraints** affecting project continuity.
- (ii) **Force Majeure Events Impacting ATMS Implementation**
 - a. Natural disasters, pandemics, war, civil disturbances, or government-imposed restrictions affecting ATMS-related activities.
- (iii) **Suspension Due to Contractor Default**
 - a. Non-compliance with **approved technical specifications** and safety requirements.
 - b. Failure to maintain project progress in accordance with the contract timeline.

- c. Discovery of serious deficiencies in **hardware, software, or integration processes** that could compromise system functionality.

15.1.3 Contractor's Rights & Remedies During Suspension

- (i) If suspension is **ordered by the Client** for reasons **not attributable to the Contractor**, the Contractor shall:
 - a. Be entitled to compensation for **idling ATMS-related resources, equipment, and site overhead costs**, provided the suspension exceeds **30 consecutive days**.
 - b. Have the right to request contract extension equivalent to the suspension period.
- (ii) If suspension is due to **Contractor's default**, the Contractor shall:
 - a. Rectify deficiencies within the timeframe specified by the Client.
 - b. Bear all associated costs incurred during the rectification period.
- (iii) If suspension extends beyond 90 days, either party may initiate discussions to **review feasibility of contract continuation** or **invoke contract termination under Clause 15.2**.

15.1.4 Resumption of Work

Upon removal of the reason for suspension, the Client shall formally direct the Contractor to **resume work** within **7 days**. The Contractor shall:

- (i) Immediately **restart installation, integration, and commissioning of the ATMS system**.
- (ii) Submit a revised work schedule, if required, **without additional financial claims**, unless suspension was due to **Client-ordered delays**.

If the Client fails to issue a resumption order **within 30 days** after the cause of suspension ceases to exist, the Contractor shall be entitled to **terminate the contract under Clause 15.3** and claim compensation for work already performed.

15.2 Termination for Default

15.2.1 Grounds for Termination

The **Client** reserves the right to terminate the Contract, in whole or in part, if the **Contractor fails to perform contractual obligations** despite formal notices.

Termination for default may be invoked under the following conditions:

- (i) **Non-Performance & Breach of Contractual Obligations**
 - a. Persistent failure to **meet project milestones, timelines, or performance requirements** related to the Advanced Traffic Management System (ATMS).
 - b. Repeated failure to **comply with technical specifications**, safety regulations, or quality standards set by the Client.
 - c. Unauthorized deviations from **approved ATMS design, integration plans, or operational guidelines**.
- (ii) **Financial & Legal Non-Compliance**
 - a. Failure to pay statutory dues, subcontractor payments, or suppliers, leading to disruption of project execution.
 - b. Engaging in fraudulent, unethical, or corrupt practices, including misrepresentation of project progress, financial claims, or material compliance.
 - c. Legal action against the Contractor affecting its ability to complete the Contract.
- (iii) **Abandonment or Prolonged Work Stoppage**
 - a. Suspension of work for more than **30 days** without valid justification or Client approval.
 - b. Withdrawal from site or substantial reduction in work force/equipment, rendering project execution infeasible.

15.2.2 Notice & Rectification Period

- (i) The Client shall issue a **Notice of Default**, providing the Contractor a **cure period of 15 days** to rectify the identified breach.
- (ii) If the Contractor **fails to remedy the default** within the prescribed period, the Client shall issue a **Final Termination Notice**, terminating the Contract effective immediately or on a date specified therein.

15.2.3 Consequences of Termination for Default

(i) **Forfeiture of Performance Security**

- a. The Client shall have the right to **invoke the Performance Bank Guarantee (PBG)** and retain any unpaid dues as compensation for damages.

(ii) **Engagement of Third-Party Contractors**

- a. The Client may engage another contractor to complete the remaining ATMS works at the risk and cost of the terminated Contractor.
- b. Any excess cost incurred by the Client due to such re-engagement shall be **recoverable from the terminated Contractor**.

(iii) **Dismantling & Handover Obligations**

- a. The Contractor shall immediately **cease all site operations**, vacate premises, and hand over all **installed ATMS components, software, and related documentation**.
- b. If the Contractor fails to remove its equipment/materials within **30 days of termination**, the Client shall have the right to dispose of them at the Contractor's cost.

(iv) **Liability for Delays & Damages**

- a. The Contractor shall be liable for all **financial losses, liquidated damages, or penalties** imposed under the contract due to non-performance.
- b. The Client reserves the right to blacklist the Contractor from future projects.

15.2.4 **Contractor's Rights in Case of Disputed Termination**

- (i) If the Contractor **disputes the termination**, it may initiate proceedings under **Clause 16 (Dispute Resolution)**.
- (ii) Until a final decision is reached, the termination shall remain effective, and the Client shall have full authority to proceed with alternative arrangements.

15.3 Termination for Convenience

15.3.1 Right to Terminate for Convenience

The **Client** reserves the right to terminate the Contract, in whole or in part, at any time **without assigning any reason**, if such termination is deemed necessary for project, administrative, or strategic reasons. This termination shall not be considered a breach of contract.

15.3.2 Notice Period & Effective Date

- (i) The Client shall issue a **written Notice of Termination** to the Contractor, specifying the effective date of termination, which shall be no less than **30 days** from the date of notice issuance.
- (ii) The Contractor shall immediately commence demobilization and prepare for the orderly cessation of work, ensuring minimal disruption to ongoing operations.

15.3.3 Obligations Upon Termination

- (i) **Cessation of Work**
 - a. Upon receipt of the termination notice, the Contractor shall **stop all work**, except for activities necessary for protection, safety, and handover of the partially completed ATMS system.
- (ii) **Handover & Documentation**
 - a. The Contractor shall submit all **designs, drawings, test reports, manuals, software codes (if applicable), and project records** in an organized manner.
 - b. Any **uninstalled materials, spare parts, or hardware** intended for ATMS implementation shall be handed over to the Client as per mutually agreed terms.
- (iii) **Demobilization & Site Clearance**
 - a. The Contractor shall **remove all personnel, equipment, tools, and temporary facilities** from the site within **15 days** of the termination's effective date.
 - b. Any failure to clear the site within the stipulated period shall entitle the Client to **dispose of such materials at the Contractor's cost**.

15.3.4 Compensation & Payment Settlement

(i) **Payment for Completed Work**

- a. The Contractor shall be paid for **all completed and accepted works** up to the termination date, based on agreed BoQ rates and milestones.
- b. No payment shall be made for any **unexecuted, pending, or anticipated works**.

(ii) **Compensation for Demobilization**

- a. Where applicable and in accordance with the provisions of the RFP, reasonable demobilization costs shall be reimbursed to the Contractor, subject to prior approval by the Client.

(iii) **No Claims for Loss of Profit**

- a. The Contractor shall have **no claim for anticipated profits, indirect losses, or any financial damages** arising from termination for convenience.

15.3.5 Dispute Resolution for Termination Compensation

- (i) If the Contractor **disputes the settlement amount**, it may initiate proceedings under **Clause 16 (Dispute Resolution)**.
- (ii) Until a final decision is reached, the Contractor shall comply with all **termination obligations**, including site clearance and handover.

15.3.6 Obligations Upon Termination

This clause defines the obligations of both **Client** and **Contractor** following the termination of the Contract, whether due to **default, convenience, or force majeure**. The primary objective is to ensure an orderly exit, protect the interests of both parties, and prevent any disputes over responsibilities.

15.3.7 Cessation of Work & Demobilization

- (i) Upon receiving the **Notice of Termination**, the Contractor shall:
 - a. **Immediately cease all ongoing work**, except those activities required for safety, protection of completed works, or as instructed by the Client.

- b. **Withdraw all personnel, equipment, and temporary site facilities** within **15 days** of the termination's effective date.
 - c. **Secure all materials, records, and installations** to prevent damage, deterioration, or loss during handover.
- (ii) The Contractor shall not undertake any new procurement, manufacturing, or **subcontracting** after receiving the termination notice unless expressly approved by the Client.

15.3.8 Handover of Completed & Partially Completed Works

- (i) The Contractor shall submit an **inventory report** detailing:
 - a. Completed works ready for handing over.
 - b. Partially completed installations and their current status.
 - c. Unused or surplus materials available on-site.
- (ii) The Contractor shall transfer ownership of all **installed and in-progress works**, ensuring they are protected until the Client assumes full control.
- (iii) Any **uninstalled materials, components, or spare parts** shall be handed over as per mutually agreed terms.

15.3.9 Submission of Project Documentation

The Contractor shall submit the following within **15 days** of termination:

- (i) **Technical Records & Drawings**
 - a. As-built drawings, design reports, specifications, and test certificates.
 - b. System architecture, software configurations (if applicable), and integration documents.
- (ii) **Operational & Maintenance Manuals**
 - a. Documentation necessary for the Client to manage and maintain the ATMS system post-termination.
- (iii) **Financial & Commercial Records**
 - a. Payment claims, invoices, material reconciliation statements, and subcontractor settlements.
- (iv) **Key Deliverables & Software Handover (if applicable)**

- a. Any proprietary software, source codes, license keys, or passwords necessary for system operation.

15.3.10 Financial Settlement & Payment Deductions

(i) **Payment for Completed Work**

- a. The Contractor shall be paid for all **completed and accepted works** up to the termination date, based on agreed **BoQ rates and milestone payments**.

(ii) **Adjustments & Deductions**

- a. The Client reserves the right to **deduct penalties, damages, or recoverable advances** from the final settlement amount.
- b. No payment shall be made for any **unexecuted, pending, or anticipated works**.

(iii) **Final Account & Discharge**

- a. The Contractor shall submit the **Final Payment Statement** within **30 days** of termination, after which the Client shall process the final settlement.
- b. Upon receipt of final payment, the Contractor shall provide a **“No Further Claims” declaration**, confirming that all dues are settled.

15.3.11 Site Clearance & Exit Formalities

- (i) The Contractor shall **clear the site** of all **temporary structures, debris, equipment, and waste materials** within **30 days** of termination.
- (ii) If the Contractor **fails to clear the site**, the Client may dispose of the materials at the **Contractor’s risk and cost**.

15.3.12 Non-Compromise of Client’s Rights

- (i) Termination shall **not absolve the Contractor** of any liabilities related to:
 - a. Defects, non-compliance, or breach of contract prior to termination.
 - b. Outstanding obligations such as warranty, indemnities, or intellectual property rights.

- (ii) The Client retains the right to **re-procure the remaining work at the Contractor's cost** if the termination was due to default.

15.3.13 Dispute Resolution

Any dispute regarding:

- (i) **Final payments, deductions, or recoveries**
 - (ii) **Responsibility for site clearance or handover obligations**
... shall be resolved under **Clause 16 (Dispute Resolution)**.
-

16 Dispute Resolution Mechanism

16.1 Dispute Notification and Attempt at Amicable Settlement

16.1.1 If any dispute, difference, or claim arises between the Client and the Contractor concerning any aspect of this Contract, the party raising the dispute (the “Notifying Party”) shall notify the other party in writing within **seven (7) days** of the occurrence of such dispute. The notice shall include:

- (i) A clear and detailed description of the dispute;
- (ii) Relevant facts and documentary evidence in support of the claim;
- (iii) The specific contractual provision(s) under which the claim is made.

16.1.2 Upon receipt of the dispute notice, both parties **shall** make genuine efforts to resolve the issue through direct discussions within **thirty (30) days** from the date of notification.

16.2 Internal Dispute Resolution Board (IDRB)

16.2.1 If the dispute remains unresolved after the **initial 30-day period**, the matter shall be escalated to an Internal Dispute Resolution Board (IDRB) within the Client’s organization.

16.2.2 The IDRB shall comprise **three (3) senior representatives** of the Client, including:

- (i) A Senior Contracts/Legal Officer;
- (ii) A Senior Technical Officer from the relevant department;
- (iii) A Representative from the Client’s Head Office.

16.2.3 The IDRB shall **review all facts, contractual provisions, and legal aspects** of the dispute and conduct hearings (if necessary) within **forty-five (45) days** from the date of referral. It shall issue a **reasoned written decision** within **fifteen (15) days** after concluding its review.

16.2.4 The IDRb's decision shall be **binding**, unless either party **formally objects in writing within fifteen (15) days** of receiving the decision, in which case the dispute proceeds to Mediation.

16.3 Mediation

16.3.1.1 If either party objects to the IDRb's decision, the dispute shall be referred to **Mediation within fifteen (15) days** of the objection notice.

16.3.1.2 The **Mediator shall be jointly appointed** by the Client and the Contractor. If the parties fail to agree on a Mediator within **ten (10) days**, the Mediator shall be appointed by **SAROD**.

16.3.1.3 The Mediation shall commence within **thirty (30) days** of the appointment of the Mediator. If the parties reach a settlement, it shall be **documented in writing and signed by both parties**, making it legally binding.

16.3.1.4 If the Mediation process fails to resolve the dispute within forty-five (45) days, either party **may escalate the matter to Arbitration under SAROD**, as set forth below.

16.4 Reference to SAROD Arbitration

16.4.1.1 If the dispute remains unresolved after Mediation, either party may refer the matter to the **Society for Affordable Redressal of Disputes (SAROD)** for final resolution under the **Arbitration and Conciliation Act, 1996 (as amended)**.

16.4.1.2 The SAROD arbitration process shall be conducted as follows:

- (i) Disputes up to **INR 1.5 Crore** → **Sole Arbitrator**, appointed by SAROD.
- (ii) Disputes above **INR 1.5 Crore** → **Three Arbitrators** (one appointed by each party, and the third appointed by SAROD).

16.4.1.3 The arbitration proceedings shall be held in **[New Delhi]**, India, and conducted in **English**.

16.4.1.4 The SAROD award shall be **final and binding**, subject to provisions of the **Arbitration and Conciliation Act, 1996**.

The cost of arbitration shall be **borne by the losing party**, unless otherwise directed by SAROD. If a claim is found to be **frivolous or without merit, the claimant shall bear the full arbitration cost**.

16.5 Governing Law and Jurisdiction

This Contract shall be governed by and construed in accordance with **Indian law**. Any legal proceedings arising under this Contract shall be subject to the exclusive jurisdiction of **courts at [New Delhi]**.

16.6 No Suspension of Work

- 16.6.1 The Contractor shall continue performing its contractual obligations during the dispute resolution process to ensure uninterrupted project execution.
- 16.6.2 The Contractor shall not suspend, slow down, or withhold performance of work on grounds of any pending dispute, unless a formal written suspension order is issued by the Client.
- 16.6.3 In case of any claim related to non-payment, the Contractor shall first exhaust all available dispute resolution mechanisms before considering suspension of work. Any unilateral suspension by the Contractor shall be deemed a breach of contract, and the Client shall have the right to impose penalties, including liquidated damages.

16.7 Interim Relief

Either party may seek **interim relief** from a court of competent jurisdiction before or during the dispute resolution process to **prevent irreparable harm, secure urgent relief, or preserve contractual rights**. Such relief may include, but is not limited to:

- (i) **Injunctions** to prevent an action that could cause significant financial or operational damage;

- (ii) **Specific performance orders** to compel compliance with urgent contractual obligations;
- (iii) **Security measures** to protect key assets, financial interests, or intellectual property pending final dispute resolution.

Any party seeking interim relief must demonstrate:

- (i) **A prima facie case** (clear legal grounds for relief);
- (ii) **Urgency** (imminent harm if relief is not granted);
- (iii) **Potential for irreparable harm** (losses that cannot be compensated by damages alone).

The granting of **interim relief shall not prejudice** the outcome of the final dispute resolution process, and both parties shall remain bound by the final decision of **SAROD Arbitration** as per Clause **16.4**.

17 Miscellaneous Provisions

17.1 Assignment & Novation

17.1.1 Restrictions on Assignment

The Contractor shall not assign, transfer, pledge, or sublet any part of its rights, obligations, or interests under this Contract, whether in whole or in part, to any third party without the prior **written consent of the Client**. Any unauthorized assignment shall be deemed null and void.

17.1.2 Novation by the Client

The Client reserves the right to **assign, novate, or transfer** its rights and obligations under this Contract to any entity, including but not limited to a government agency, concessionaire, or a successor entity, provided that the Contractor is notified in writing. The Contractor shall execute all necessary documents and take required actions to effect such novation without unreasonable delay.

17.1.3 Financial and Operational Risks

If the Contractor seeks an assignment or subcontracting arrangement, it shall provide sufficient justification, including financial, operational, and technical details, demonstrating that such an assignment will not:

- (i) Adversely impact **the performance of obligations** under this Contract,
- (ii) Increase **financial risks** for the Client,
- (iii) Lead to **dilution of liability** or compliance risks,
- (iv) Violate any applicable **statutory or regulatory provisions**.

17.1.4 Security & Confidentiality in Assignment

In cases where assignment or novation is permitted, the Contractor shall ensure that:

- (i) The assignee complies with all **confidentiality, intellectual property, and security obligations** under this Contract.
- (ii) No **cybersecurity risks, data protection breaches, or intellectual property violations** arise due to such transfer.
- (iii) The Client has the right to **conduct due diligence** on the proposed assignee before granting approval.

17.1.5 Liability Post Assignment or Novation

If an assignment is approved:

- (i) The **Contractor remains liable** for all obligations under this Contract unless expressly released in writing by the Client.
- (ii) Any **subcontractor or assignee** shall be **jointly and severally liable** for contractual obligations along with the Contractor.
- (iii) The Contractor shall **indemnify the Client** against any losses, claims, or damages resulting from such an assignment or novation.

17.1.6 Termination Due to Unauthorized Assignment

If the Contractor **assigns or novates** any part of the Contract without prior written approval, the Client shall have the right to:

- (i) **Terminate the Contract immediately** without liability,
- (ii) **Recover any damages, penalties, or financial losses** incurred due to such unauthorized assignment,
- (iii) **Blacklist the Contractor from future contracts.**

17.2 Conflict of Interest

17.2.1 General Obligation

The Contractor shall maintain the highest standards of integrity and professionalism while executing the Contract and shall avoid any situation that

could create or appear to create a conflict of interest. The Contractor shall immediately disclose any actual, potential, or perceived conflict of interest to the Client in writing and seek written approval before proceeding with any related activity.

17.2.2 Definition of Conflict of Interest

A conflict of interest may arise when:

- (i) The Contractor, its personnel, affiliates, or subcontractors have financial, business, or other interests that could improperly influence the execution of contractual obligations.
- (ii) The Contractor is engaged in activities or has relationships that could impair its ability to perform the Contract impartially.
- (iii) The Contractor, its key personnel, or associated entities have access to privileged or confidential information obtained under this Contract, which may be used for personal or competitive advantage.
- (iv) Any former employee of the Client is directly engaged by the Contractor without adherence to cooling-off periods or applicable regulatory restrictions.

17.2.3 Restrictions on Engagement

- (i) The Contractor shall not engage in any business, consultancy, or advisory service that may create a conflict with the performance of this Contract.
- (ii) The Contractor shall not appoint, hire, or subcontract any entity or individual who has an existing or past relationship with the Client, which may result in unfair competitive advantage or biased decision-making, unless expressly permitted by the Client in writing.

17.2.4 Client's Right to Investigate and Take Action

The Client reserves the right to:

- (i) Investigate any potential or actual conflict of interest.

- (ii) Direct the Contractor to take corrective measures to eliminate or mitigate the conflict.
- (iii) Terminate the Contract if the Contractor fails to disclose a conflict of interest or takes actions that compromise the Client's interests.

17.2.5 Contractor's Declaration and Continuous Compliance

- (i) The Contractor shall, at the time of entering into this Contract, provide a declaration stating that no conflict of interest exists.
- (ii) If any conflict arises during the execution of the Contract, the Contractor shall immediately notify the Client and await further instructions.
- (iii) Failure to comply with this provision shall be treated as a material breach, entitling the Client to take appropriate remedial actions, including suspension or termination of the Contract.

17.3 Severability of Contract

17.3.1 General Principle

If any provision or part of this Contract is found to be invalid, illegal, or unenforceable by a court of competent jurisdiction or any applicable law, such provision shall be deemed severed from the Contract and shall not affect the validity or enforceability of the remaining provisions, which shall continue in full force and effect.

17.3.2 Adjustment and Modification

In the event of severance of any provision, the Client and the Contractor shall negotiate in good faith to replace such provision with a lawful and enforceable provision that best achieves the intended purpose of the original clause. If no mutual agreement is reached, the Client's decision shall prevail, provided it remains within the scope of applicable laws and contractual obligations.

17.3.3 Preservation of Contractual Intent

The severance of any provision shall not:

- (i) Invalidate the Contract as a whole.

- (ii) Affect the rights, obligations, or liabilities that have already accrued under the Contract.
- (iii) Limit the Client's ability to enforce the Contract in a manner consistent with its original intent.

17.3.4 **Non-Waiver of Rights**

The failure of either party to enforce any term of this Contract due to the severability of a provision shall not constitute a waiver of the remaining terms, nor shall it be construed as a modification of the Contract unless expressly agreed in writing by both parties.

17.4 Exit Management & Handover

17.4.1 **Purpose and Applicability**

This clause sets out the procedures and obligations of the Contractor for the orderly transition of responsibilities, assets, and knowledge upon the expiration, termination, or completion of the Contract. The Contractor shall ensure that the exit process is executed in a manner that minimizes disruption to ongoing operations and maintains service continuity.

17.4.2 **Exit Management Plan**

- (i) Within **[30] days** of contract commencement, the Contractor shall submit an Exit Management Plan for Client approval, detailing:
 - a. Transfer of assets, equipment, and data.
 - b. Transition of responsibilities to the Client or a new service provider.
 - c. Retention and transfer of knowledge, documentation, and intellectual property.
 - d. Staff demobilization and redeployment strategy.
 - e. Timelines and procedures for an effective handover.
- (ii) The Exit Management Plan shall be updated annually or as required by the Client.

17.4.3 **Obligations of the Contractor**

Upon termination or completion of the Contract, the Contractor shall:

- (i) Provide all necessary assistance to facilitate the transition, including training and knowledge transfer.
- (ii) Hand over all project-related documents, including reports, records, data, manuals, and software (if applicable).
- (iii) Transfer ownership of assets, materials, and inventory procured for the project, as per contractual terms.
- (iv) Ensure the continued functionality of the Automated Traffic Management System (ATMS) until full transition is achieved.
- (v) Cooperate with the Client and any newly appointed Contractor to prevent service disruptions.

17.4.4 **Transfer of Data and Intellectual Property**

- (i) The Contractor shall return or securely transfer all confidential data, intellectual property, and system access credentials to the Client.
- (ii) No copies of project-related confidential information shall be retained by the Contractor without the Client's written consent.

17.4.5 **Asset and Equipment Handover**

- (i) All assets, including ATMS infrastructure, hardware, software, and tools procured under the Contract, shall be handed over in fully operational condition.
- (ii) A joint verification shall be conducted by the Client and Contractor to confirm the condition of the assets before final handover.

17.4.6 **Financial and Commercial Settlements**

- (i) All outstanding invoices, claims, penalties, and liabilities shall be settled before contract closure.

- (ii) The Contractor shall ensure no pending financial obligations remain that could impact the Client or successor entity.

17.4.7 Certification of Handover and Contract Closure

- (i) Upon satisfactory completion of exit procedures, the Client shall issue a Handover Certification confirming the Contractor's compliance with exit obligations.
- (ii) The Contract shall be considered formally closed only after the issuance of the Handover Certification.

17.4.8 Survival of Obligations

The obligations under this clause shall survive the termination or expiration of the Contract to ensure a smooth transition and legal compliance.

17.5 General Compliance

17.5.1 Compliance with Laws, Regulations, and Standards

The Contractor shall comply with all applicable laws, regulations, standards, and guidelines, including but not limited to:

- (i) The relevant provisions of the contract, technical specifications, and drawings.
- (ii) All applicable local, state, and national laws governing construction, safety, labor, environment, taxation, and contractual obligations.
- (iii) The guidelines issued by the Ministry of Road Transport & Highways (MoRTH), the National Highways Authority of India (NHAI), Indian Roads Congress (IRC), Bureau of Indian Standards (BIS), and other statutory authorities as applicable.
- (iv) International best practices such as FIDIC principles, if stipulated in the contract.

17.5.2 Compliance with Safety, Health, and Environmental (SHE) Requirements

- (i) The Contractor shall adhere to all occupational health, safety, and environmental protection laws, ensuring the well-being of workers, project personnel, and the public.
- (ii) Adequate safety measures, including personal protective equipment (PPE), barricading, signage, and emergency response plans, shall be implemented at all work sites.
- (iii) The Contractor shall conduct regular safety audits and provide necessary training to site personnel.
- (iv) Waste management, pollution control, and resource conservation measures shall be adopted in compliance with environmental regulations.

17.5.3 Permits, Approvals, and Licenses

- (i) The Contractor shall obtain and maintain all necessary permits, approvals, and licenses required for the execution of the works.
- (ii) Any failure to secure such approvals shall not relieve the Contractor from its obligations under the Contract.

17.5.4 Labor Laws and Ethical Practices

- (i) The Contractor shall comply with all labor laws, including provisions related to wages, working hours, social security, and workplace conditions.
- (ii) No child labor, forced labor, or unfair employment practices shall be permitted at any stage of project execution.
- (iii) The Contractor shall ensure fair wages and timely payment to all workers and subcontractors.

17.5.5 Quality Assurance and Material Compliance

- (i) All materials, equipment, and workmanship shall conform to the prescribed standards and specifications set forth in the contract.

- (ii) The Contractor shall establish a robust Quality Assurance and Quality Control (QA/QC) system, including material testing, third-party inspections, and compliance with specified Indian and international standards.
- (iii) Any material or work found non-compliant shall be rectified or replaced at the Contractor's cost.

17.5.6 Reporting and Documentation

- (i) The Contractor shall maintain detailed records of compliance with contractual obligations, including test reports, safety audits, permits, and regulatory approvals.
- (ii) Regular compliance reports shall be submitted to the Client as per the specified intervals.

17.5.7 Non-Compliance and Penalties

- (i) *Failure to comply with the provisions given in the clauses of this GCC* may result in penalties, suspension of work, or termination of the contract, as determined by the Client.
- (ii) The Contractor shall bear all costs associated with rectifying any non-compliance issues.

17.5.8 Indemnification for Non-Compliance

The Contractor shall indemnify the Client against any liabilities, penalties, or legal actions arising from non-compliance with applicable laws, regulations, or contract provisions.

17.6 Interpretation of Contract

- 17.6.1 **Harmonious Interpretation:** The provisions of this Contract shall be interpreted in a manner that ensures consistency and avoids redundancy. In the event of any ambiguity, inconsistency, or contradiction between the clauses of this

Contract or its associated documents, an interpretation that best aligns with the intent and objectives of the Agreement shall prevail.

17.6.2 **Order of Precedence:** The priority of contract documents shall be as per **Clause 2.6 (Priority of Documents)**.

17.6.3 **Resolution of Ambiguities:** If a dispute arises regarding the interpretation of any provision, the parties shall attempt to resolve it through mutual consultation. If unresolved, the matter shall be referred to the dispute resolution mechanism outlined in **Clause 16 (Dispute Resolution)**.

17.6.4 **No Clause to be Rendered Redundant:** No clause in this Contract shall be interpreted in a manner that renders any other clause redundant or inapplicable. Each provision shall be given effect to the fullest extent possible in alignment with the overall intent of the Contract.

17.7 Confidentiality & Intellectual Property Rights

17.7.1 Ownership of Deliverables

All reports, data, software, source codes, algorithms, system configurations, manuals, designs, drawings, and any other work products created, developed, or provided by the Contractor under this Contract shall be the exclusive property of the Client. The Contractor shall not use, reproduce, modify, or disclose such deliverables for any purpose beyond this Contract without the prior written consent of the Client.

17.7.2 Confidential Information

The Contractor shall treat all information received, accessed, or generated under this Contract as confidential, including but not limited to technical, operational, financial, and security-related information. The Contractor shall not disclose such information to any third party except:

- (i) With the prior written consent of the Client, or
- (ii) When required by law, provided that the Contractor notifies the Client in advance.

Confidentiality obligations shall survive the completion or termination of this Contract.

17.7.3 Intellectual Property Warranty

The Contractor warrants that all work, software, methodologies, and materials supplied under this Contract do not infringe upon any third-party intellectual property rights, including patents, copyrights, trademarks, or trade secrets. Any infringement claims shall be solely the responsibility of the Contractor, who shall indemnify and hold the Client harmless against any legal consequences arising from such claims.

17.7.4 Proprietary Technology & Pre-Existing Rights

If the Contractor incorporates proprietary software, tools, or methodologies owned by the Contractor into the ATMS system, they must obtain prior written approval from the Client. Ownership of such proprietary elements shall remain with the Contractor unless explicitly transferred in writing. However, the Client shall have a **royalty-free, irrevocable, and perpetual license** to use such proprietary technology solely for the operation and maintenance of the ATMS.

17.7.5 Return & Destruction of Data

Upon termination or expiration of this Contract, the Contractor shall return or securely destroy all confidential data, access credentials, software, and documentation related to the ATMS system, as per the Client's instructions. The Contractor shall certify in writing that no copies of such materials have been retained.

17.7.6 Compliance with Laws & Standards

The Contractor shall comply with all applicable intellectual property laws, confidentiality laws, and ATMS security standards, including but not limited to:

- The Copyright Act, 1957
- The Patents Act, 1970
- The Information Technology Act, 2000 (as amended)
- Any specific regulatory guidelines applicable to ATMS operations in India.

17.8 Third-Party Rights

17.8.1 No Rights Conferred to Third Parties

This Contract does not create any rights or benefits enforceable by any person or entity that is not a party to this Contract. No third party shall have any claim, right, or entitlement to enforce any term of this Contract unless expressly stated otherwise.

17.8.2 Contractor's Responsibility for Third-Party Agreements

If the Contractor engages subcontractors, consultants, or third-party service providers to perform any part of the Works or Services under this Contract, the Contractor shall remain fully responsible for their compliance with the terms and conditions of this Contract. The Contractor shall ensure that:

- i) All third parties engaged comply with applicable laws, regulations, and contractual obligations.
- ii) No subcontracting arrangement relieves the Contractor of its responsibilities under this Contract.
- iii) Any third-party intellectual property rights incorporated into the Works are lawfully obtained, with the necessary rights granted to the Client.

17.8.3 Indemnity Against Third-Party Claims

The Contractor shall indemnify and hold harmless the Client against any claims, losses, damages, or legal proceedings arising from third-party actions, including but not limited to:

- i) Intellectual property infringement claims.
- ii) Liabilities due to acts, omissions, or defaults of third parties engaged by the Contractor.
- iii) Any disputes arising between the Contractor and its subcontractors, suppliers, or service providers.

17.8.4 No Privity of Contract with Client's Stakeholders

The Client shall not be liable for any contractual obligations, liabilities, or disputes between the Contractor and its subcontractors, vendors, or service providers. Any such third parties shall have no legal recourse against the Client in relation to this Contract.

17.8.5 Compliance with Third-Party Licenses & Approvals

If the performance of the Works requires the use of any third-party software, tools, or technology, the Contractor shall obtain all necessary licenses, approvals, and consents at its own cost. The Contractor shall ensure that the Client is granted a valid, non-exclusive, and perpetual right to use such third-party components as required for the operation and maintenance of the Works.

17.9 Force of Documentation

17.9.1 Contractual Binding Nature of Documentation

All documents forming part of this Contract, including but not limited to specifications, drawings, manuals, software documentation, and system architecture details, shall be contractually binding on the Contractor and the Client. Any obligations, warranties, and performance criteria outlined in these documents shall be enforceable as per the terms of this Contract.

17.9.2 **Order of Precedence**

In case of any inconsistency or conflict between different documents forming part of this Contract, the order of precedence shall be determined as per **Clause 2.6 – Priority of Documents**. The Contractor shall not rely on any informal communications, emails, or unsigned documents that are not part of the officially approved contract documentation.

17.9.3 **Software, IT Systems & Technical Documentation**

For contracts involving software development, IT systems, and ATMS (Advanced Traffic Management System) components, the following shall apply:

- i) **Software Documentation & Source Code:** The Contractor shall provide complete and accurate technical documentation, user manuals, and system architecture details as per the Contract. The source code shall be shared with NHIT only if the Contractor ceases its line of business or withdraws after-sales service support during the contract period.
- ii) **Version Control & Updates:** All software and IT-related documents must reflect the latest approved version, with proper version control maintained by the Contractor. Any updates to software documentation must be formally submitted and approved before implementation.
- iii) **Compliance with Standards:** All technical and operational documentation related to software, databases, and IT infrastructure must comply with applicable industry standards, including but not limited to ISO, CMMI, and government IT security guidelines.

17.9.4 **Liability for Errors & Omissions in Documentation**

The Contractor shall be responsible for any errors, omissions, or inconsistencies in the documentation provided. Any misleading, incomplete, or inaccurate documentation that results in system failure, performance degradation, or additional costs shall be rectified at the Contractor's expense without any impact on the Project Timeline or Contract Price.

17.9.5 **Obligation to Maintain and Transfer Documentation**

The Contractor shall maintain an updated record of all contractually relevant documentation throughout the duration of the Contract. Upon completion or termination of the Contract, all such documentation, including software manuals, system architecture details, and IT network configurations, shall be handed over to the Client in a structured and accessible format.

17.10 **Provisions for Emergencies**

17.10.1 **Definition of Emergency**

For the purpose of this Contract, an emergency shall include, but not be limited to:

- i) **Cybersecurity Incidents** – Any unauthorized access, hacking attempts, data breaches, malware attacks, ransomware, or any other cyber threats impacting the security and integrity of the system.
- ii) **System Failures** – Major disruptions in the ATMS (Advanced Traffic Management System), network failures, server crashes, software malfunctions, or critical hardware failures affecting the operation of the system.
- iii) **Force Majeure Events** – Any unforeseen circumstances such as natural disasters, fire, or infrastructure failures that impact the system's functionality.

17.10.2 **Emergency Response & Mitigation Measures**

- i) The Contractor shall implement a **24/7 emergency response mechanism** to detect, report, and mitigate emergencies related to cyber threats and system failures.
- ii) A **Business Continuity Plan (BCP)** and **Disaster Recovery Plan (DRP)** shall be maintained by the Contractor to ensure minimal downtime and quick recovery. These plans shall be periodically updated and tested as per industry best practices.

- iii) The Contractor shall establish **cyber incident response procedures**, including immediate containment, forensic analysis, mitigation, and reporting mechanisms, in compliance with the IT Act 2000 and CERT-In guidelines.

17.10.3 Notification & Reporting

- i) The Contractor shall notify NHIT of any system failure or cybersecurity incident **within 30 minutes of detection** and submit an initial report detailing the nature and impact of the issue.
- ii) A **detailed Root Cause Analysis (RCA)** report along with corrective and preventive actions shall be submitted within **48 hours** of incident resolution.
- iii) The Contractor shall cooperate fully with NHIT and any regulatory or investigative agencies involved in addressing the incident.

17.10.4 Data Protection & Recovery

- i) The Contractor shall ensure that **data backups** are maintained as per contractual obligations and regulatory requirements. Periodic backup testing shall be conducted to verify data integrity.
- ii) In case of **data loss or corruption**, the Contractor shall be responsible for restoring the system to its last known stable state within the agreed **Recovery Time Objective (RTO)** and **Recovery Point Objective (RPO)**.

17.10.5 Penalty for Non-Compliance

Failure to comply with the provisions given in the clauses of this GCC regarding emergency response, cybersecurity, and system failures shall subject the Contractor to **penalties**, including but not limited to monetary deductions, suspension of contract obligations, or termination, as deemed appropriate by NHIT.

17.11 Waiver

17.11.1 Non-Waiver of Rights

No delay, omission, or failure by NHIT or the Contractor in exercising any right, power, or remedy under this Contract shall be construed as a waiver thereof. Any single or partial exercise of any right, power, or remedy shall not preclude any further exercise of the same or any other right, power, or remedy available under this Contract or under applicable law.

17.11.2 Written Waiver Requirement

A waiver of any term, provision, or breach of this Contract shall only be effective if expressly made in writing and duly signed by the authorized representative of the waiving party. Any such waiver shall be limited to the specific instance and circumstances stated in the waiver and shall not be deemed a continuing waiver of any subsequent breach or default.

17.11.3 No Implied Waiver

The failure of NHIT to enforce any provision of this Contract, or to require performance by the Contractor at any time, shall not be construed as a waiver of NHIT's right to enforce such provision at a later stage.

17.11.4 Preservation of Contractual Rights

The waiver of any term or condition in one instance shall not be deemed a waiver of any subsequent breach of that term or condition or of any other term or condition in this Contract. All rights and remedies available to NHIT and the Contractor shall remain cumulative and shall not be affected by any waiver granted.

17.12 Entirety of Agreement

17.12.1 Comprehensive Contractual Understanding

This Contract, including all annexures, schedules, appendices, and documents expressly incorporated by reference, constitutes the entire agreement between

NHIT and the Contractor concerning the subject matter hereof. It supersedes all prior negotiations, communications, representations, agreements, and understandings, whether written or oral, relating to the same.

17.12.2 **No Reliance on External Representations**

Each party acknowledges that, in entering into this Contract, it has not relied upon any statement, representation, assurance, or warranty not expressly set out herein. No terms or conditions outside this Contract shall be binding unless expressly agreed upon in writing and duly executed by both parties.

17.12.3 **Amendments & Modifications**

Any modifications, amendments, or variations to this Contract shall be valid only if made in writing and signed by the authorized representatives of both parties. No oral modifications shall be recognized or enforceable.

17.12.4 **Precedence & Dispute Resolution Reference**

In case of any ambiguity or inconsistency between this Contract and any other related document, the **order of precedence shall be followed as per Clause 2.6 (Priority of Documents)**. Any disputes arising due to such inconsistencies shall be resolved in accordance with **Clause 16 (Dispute Resolution)**.

17.13 **Survival of Terms**

All provisions of this Contract, which by their nature or intent are meant to survive its expiration or termination, shall remain in full force and effect. These include, but are not limited to, clauses relating to **Confidentiality & Intellectual Property Rights, Third-Party Rights, Force of Documentation, Dispute Resolution, Indemnities and Liabilities, Exit Management & Handover, and any other provisions necessary for enforcement post-contract closure**. The survival of these obligations ensures that the rights and liabilities of the parties

remain enforceable beyond the contract period in accordance with applicable laws and contractual commitments.

17.14 Acknowledgment

The Contractor acknowledges that they have read and understood the terms and conditions of this Contract, including all annexures, appendices, and referenced documents. By signing this Agreement, the Contractor agrees to be bound by its terms and confirms their capability to fulfill all obligations outlined herein. The Contractor also warrants that they have sought independent legal or professional advice as necessary to comprehend the implications of this Contract fully.

17.15 Language of the Contract

The official language of this Contract shall be English. All correspondence, documentation, instructions, reports, software documentation, system logs, and deliverables related to this Contract shall be prepared, submitted, and interpreted in English only. In case of any discrepancy between translations of this Contract or any associated documents in another language, the English version shall prevail.

The Contractor shall ensure that its personnel, subcontractors, and agents possess sufficient proficiency in English to comply effectively with the terms and obligations under this Contract. Any translation of this Contract or its related documents into another language shall be for convenience only and shall not carry legal validity unless expressly agreed upon in writing by both parties.

The parties acknowledge that clarity and consistency in communication are critical for the successful execution of this Contract, and this provision shall be binding on all parties.

Schedule-B Terms of Reference

(To insert contents of Part-II)

